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Knowledge and Morality of School-Age Children and Adolescents Regarding Environmental Issues and Moral Dilemmas

Carla Luciane Blum Vestena¹, Fernanda Hellen Ribeiro Piske²

¹Unicentro, Guarapuava, Brazil

²Federal University of Parana, Curitiba, Brazil

Email: nandahellen@hotmail.com

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Abstract

A research gap exists with regard to the analysis of school children and adolescents' awareness on environmental issues. Current investigation analyzes data of 240 children and adolescents, aged between 8 and 14 years, within different school contexts in the mid-southern region of Brazil, on their knowledge level and moral judgment on solid wastes, river water and tree life. Whereas the exploratory research with different groups of different ages verifies the manner behavior emerges and changes, the transversal design gives an evolution aspect of data through the examination of a great number of agents. Results showed that children and adolescents have similar knowledge on the environment within different school contexts, except differences at environmental knowledge level. The latter revealed a mild broadening trend in proportion to the 8 - 14 years age bracket. Environmental moral judgment varied a lot, regardless of the agents' age, and failed to be related to the knowledge that children and adolescents had on the environmental themes. Schools featuring well-defined pedagogical proposals were positively salient among the others. Environmental knowledge and moral judgment on environmental issues are not determining but implied chiefly as from the age of eleven, since both are the result of the agents' social interactivity within the environment and basically require affectivity and cooperation.

Keywords

Piaget, Socio-Environmental Knowledge, Moral Judgement

1. Introduction

Environmental issues are a worldwide fact to be taken into consideration in contemporary society, since they affect quality of life on our planet. Despite

environmental warnings given since the 1960s, the proposal for sustainable development especially following the Rio-92 Summit has shown itself to still be ambiguous with regard to justice to reduce social inequalities and overcome socio-environmental problems within and between countries.

As such, following the Stockholm event, environmental education has been highlighted as strategic and a priority in preparing for citizenship that includes socio-environmental values. In Brazil the current National Curricular Guidelines on Environmental Education (Brasil, 2012) reaffirm that socio-environmental issues must be part of initial and ongoing teacher training curricula, as also determined by the Environmental Education Policy (Brasil, 1999) and the Official Gazette of the Federal Republic of Brazil (Brasil, 2002).

Research into students' perception of environmental problems has shown the existence of children who did not know the real physical conditions of local natural elements, even though they take part in Environmental Education projects in Brazil's schools. Data analysed by the *Organization for Economic Cooperation and Development* OECD (2009) showed that teenagers born in the 1990s in Brazil had a knowledge *deficit* in relation to environmental issues.

Studies have shown that few teachers teach Environmental Education, that they are unaware of how children and adolescents acquire knowledge and that they give little value to the role of social interactions in the learning process.

There is a shortage of research analysing the awareness and morality of school-age children and adolescents regarding environmental issues.

This article presents the analysis of data on 240 children and adolescents aged between eight and fourteen, from different school settings in South Central Brazil, as to their level of knowledge and moral judgement about solid waste, river water and tree life.

2. Methods

This is an exploratory study of different groups of subjects of different ages, undertaken between 2006 and 2010, to observe how conducts appear and change. A cross-sectional design was adopted because it enables a view to be obtained of evolutionary data in a short space of time as well as enabling a large number of subjects to be studied.

The interviews undertaken are based on research themes defined by means of observations conducted in 2008 and 2009, involving the accompaniment of students in each grade during Environmental Education activities, during in-school activities (lessons) and out-of-school activities (trips, cinema, visits).

The interviews took place in 2009 and lasted between 12 and 30 minutes depending on the age of the children and adolescents. The list of questions and moral dilemmas was validated by means of a pilot study performed with two subjects aged 8, two aged 11 and two aged 14 from schools B1 and B2, following their parents' informed consent.

The total sample of subjects was comprised of 240 school children attending 3rd to 8th grade and aged 8 to 14, distributed homogeneously and of both sexes.

The number of subjects was determined by the criteria indicated above and by the need to consider ten subjects per age group, as per Delval (2002: p. 102), whereby “ten subjects is an adequate number for each age group. It is difficult to reach conclusions with a smaller number of subjects, whilst with a large number analysis is harder”.

We selected two public schools not pertaining to any religion and three private schools, one of which pertained to a religion whilst the others did not. We attributed a pseudonym to each one of the five schools in order to maintain their identity confidential, as per Table 1.

The schools selected were basically located in the municipality of Guarapuava, in the south central region of the state of Paraná, as well as one private school in the municipality of Itapira, in the eastern region of the state of São Paulo. One of the private schools (school D) selected in Guarapuava pertained to a religion, whilst the other (school C) did not.

We sorted the data on environmental knowledge in ascending order according to the age of the 240 subjects studied. Moral judgement of environmental issues was assessed based on the respect shown by the children and adolescents with regard to environment-related moral dilemmas. The judgement made by each of the students was classified in accordance with the analysis categories adopted, namely: Moral Judgement in Respect or in Disrespect of the Environment.

3. Results and Discussion

1) Children and adolescents' level of knowledge

The results indicated that both the children and the adolescents in the different school settings have similar environmental knowledge. The only difference in the level of environmental knowledge was a moderate tendency to increased knowledge as age increased, from eight to fourteen years old.

A significant number of children and adolescents showed a discrepancy from the general tendency, according to the different levels of development, both

Table 1. Principal characteristics of the selected schools.

School	PRINCIPAL CHARACTERISTICS
A	Private. Not pertaining to any religion. Infant, Primary and Middle School Education (1 st to 8 th grade). Has a well-defined teaching concept,* based on Piagetian studies. Does not use handouts and textbooks. Located in the town of Itapira/SP .
B1	Public. Municipal. Not pertaining to any religion. Infant and Primary School Education (1 st to 4 th grade). Does not have a well-defined teaching concept. Uses textbooks. Located on the outskirts of the town of Guarapuava/PR .
B2	Public. State-level. Not pertaining to any religion. Middle School Education (5 th to 8 th grade). Does not have a well-defined teaching concept. Uses textbooks. Located in the town of Guarapuava/PR .
C	Private. Not pertaining to any religion. Infant, Primary and Middle School Education (1 st to 8 th grade) and Sixth Form (1 st to 3 rd grade). Does not have a well-defined teaching concept. Uses textbooks. Located in the town of Guarapuava/PR .
D	Private. Pertaining to a religion—Roman Catholic. Infant, Primary and Middle School Education (1 st to 8 th grade) and Sixth Form (1 st to 3 rd grade). Does not have a well-defined teaching concept. Uses textbooks. Located in the town of Guarapuava/PR .

*A defined teaching concept is understood to mean a school that organizes what it teaches based on a theoretical reference.

greater and lesser, such as, for example, children aged thirteen and fourteen with only preliminary knowledge of environmental issues (Figure 1).

Preliminary Environmental Knowledge occurred mainly in children aged between eight to ten and eleven years old. For example, predominant knowledge about residual waste is hermetic, i.e. it is limited to isolated phases and to distinguishing objects. There is no understanding of the systemic process of the decomposition of solid waste disposed of in inappropriate places, nor of the specific decomposition characteristics of each type of matter (food, paper, PET and glass bottles (Table 2).

Students with preliminary environmental knowledge have no specific knowledge about trees, their importance, social and ecological function. Trees appear to be an element in isolation from the rest of nature's elements. The students think that rivers are polluted because they notice solid wastes on their banks and the foul smell, but they are unaware of the real causes of pollution and its effects on the health of human beings and other living beings (Figure 2).

A large number of children aged eight to ten had preliminary environmental knowledge about the process of matter transformation. Moreover, there is initial elaboration of concepts of environmental issues, whereby the process is more advanced in students aged ten, eleven and thirteen when compared to those aged eight to ten, as in general the former have systemic knowledge about one of the issues studied.

With regard to Preliminary Environmental Knowledge, the children do not show complete structures of systemic knowledge, as they have restricted knowledge

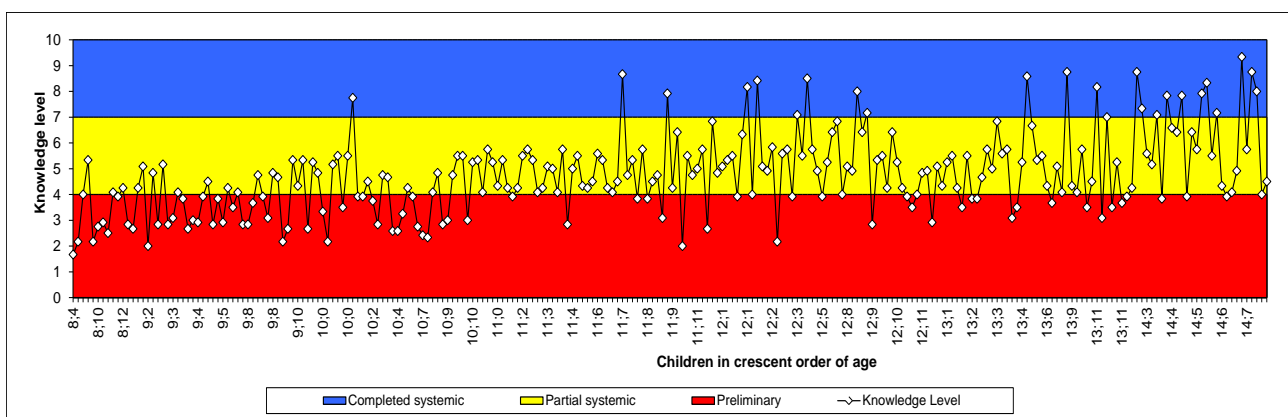


Figure 1. Children and adolescent's environmental knowledge.

Table 2. Types of environmental knowledge by age group.

Age	ENVIRONMENTAL KNOWLEDGE							
	Preliminary		Partial Systemic		Complete Systemic		TOTAL	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
8 - 10 years	48	56.5	36	42.4	1	1.2	85	100
11 - 12 years	17	19.8	61	70.9	8	9.3	86	100
13 - 14 years	15	21.7	39	56.5	15	21.7	69	100

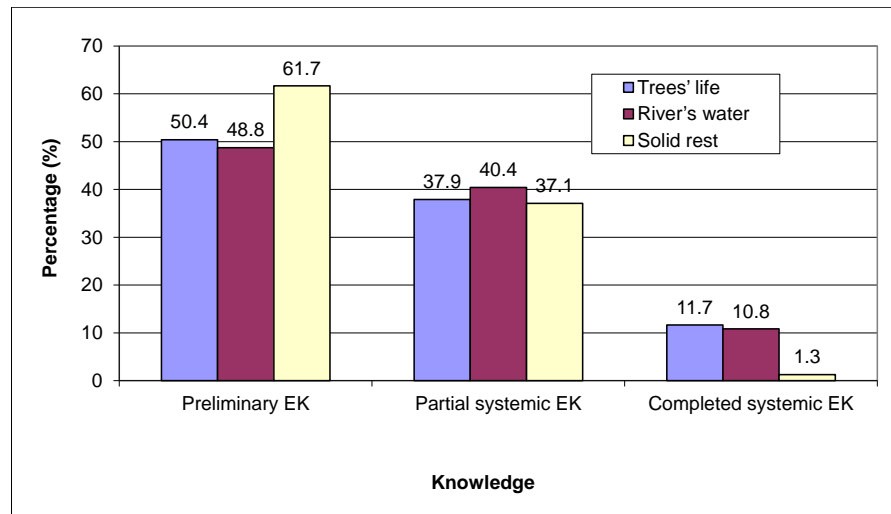


Figure 2. Children and adolescents: types of environmental knowledge.

regarding objects. For example, in relation to plastic bottles, they are unable to say where they came from, what their use is and how they decompose. Taking the example further, with regard to two questions about decomposition: (1) if two bottles of the same shape and size, one plastic and the other glass, are thrown onto wasteland, which of them will decompose first? (2) there are two bottles of the same size but different shapes, and the plastic bottle keeps its shape but the glass bottle breaks into little pieces, which bottle decomposes first? When answering these questions, the majority of the children and adolescents state that the plastic bottle will decompose first when the two bottles have the same shape, but that the glass bottle will decompose first when the bottles have different shapes (broken glass bottle). This allows us to affirm that they take shape into consideration and not matter. They still see things in an atomistic manner. This is explained because of the number of students with preliminary environmental knowledge about the environment. The following statement by one of the children exemplifies this fact:

- Which bottle decomposes quickest on a plot of wasteland, a plastic one or a glass one?

Imagine that we have two bottles, a plastic one and another just the same but made of glass. Which bottle will break down first? Hum, er, er, I think it's the plastic one.

- Why? Because glass only breaks down if it's thrown and breaks into pieces. I think that glass will take many years, although the plastic bottle will too, but I think glass is more resistant.

- And what if a complete plastic bottle and a broken glass bottle were thrown onto a plot of wasteland. Which do you think would decompose the quickest? This time I think it's the one that's broken down (referring to the glass) because there are fewer pieces in the environment for it (referring to the bottle) to break down. The smaller it is the easier it is to break down.

A. 22 (11;3)

In this case, children are in a process of elaborating the notion of substance, because it affirms that the conservation of the substance occurs in an intuitive manner, as it is based on empirical data and not on operational composition, as [Piaget \(1978\)](#) mentions.

The children and adolescents who showed Preliminary Environmental Knowledge are basically at the stage of developing Concrete Operational knowledge. To a certain extent the development of knowledge about environmental issues occurred late in relation to the development of intelligence analysed by [Piaget \(1983\)](#), as it is conceived that Preliminary Environmental Knowledge about environmental issues could coincide with the beginning of the Concrete Operational stage and Partial Systemic and Systemic Environmental Knowledge could coincide with the Formal Operational stage. However, the level of development (competence) does not necessarily coincide with knowledge (exercising).

Partial Systemic Environmental Knowledge appeared with effect from ten to eleven years of age until fourteen to fifteen. In this phase, knowledge is partitioned, sometimes in relation to a given theme, when the student shows understanding of the environmental system and of causes and consequences of actions on the environment, sometimes when the student does not know what the impacts of the actions are and/or devises false hypothesis as to the causes and consequences. Partial systemic knowledge is situated between preliminary and complete systemic knowledge and is understood to be something that is in the process of developing.

Children and adolescents with Systemic Environmental Knowledge showed that they understood the relationships between the elements of the environmental system, the causes and consequences of human interventions and their impact on the lives of living beings.

The inadequate disposal of solid waste is totally understood as causing alterations in the environment that affect the quality of natural resources and human health. The water cycle is influenced both quantitatively and qualitatively by interventions of a human nature. The movement of water on, under and above the earth's surface determines how substances are transported, such as: sediments, solid waste, effluents, etc., located on the drained area and which extrapolate the river's course. As such, alterations to the drainage area can generate impacts on the dynamics of the fluvial processes and on the quality and quantity of water, having impacts on practically all the components of the environmental system.

This level of environmental knowledge can be justified when a child coordinates the various schemas devised as the body assimilates the milieu, there being a relationship between the milieu and the body (exchanges). Thought categories undergo transformism and there is increasingly elaborate adaptation of thoughts about the elements of nature, as well as adaptation of these elements to thoughts, in accordance with [Parrat-Dayán's view \(2000\)](#) that in the domain of knowledge there is a notion of the transformism of thought categories.

In short, we found that in the thirteen to fourteen age group only 21.4% of the

adolescents showed Systemic Knowledge and the majority showed Partial Systemic Knowledge (56.5%).

A possible reasoning within knowledge about environmental issues is retarded in relation to the phases of development. These phases can be explained by the fact that in order to have systemic knowledge children and adolescents need to have operational structures that comprehend reversibility, mobility and transformations between (physical) states. This is only possible when they distinguish infralogical operations, i.e. physical operations and operations in space and time, as well as logical and mathematical operations. Infralogical operations have a bearing on positions and states and express, therefore, the transformations of objects, rather than leaving this Constant (Piaget, 1979).

2) Children and adolescents' level of moral judgement of environmental impacts

We noted that the students, from eleven years onwards, although principally the older ones, demonstrated a more significant level in disrespect of the environment than younger children and adolescents aged eight to eleven (Figure 3).

In general, Moral Judgement (MJ) in Respect of the Environment was predominant in 83.3% of the environmental dilemmas, whilst MJ in Disrespect of the Environment was 16.7%. When assessing MJ incidence in relation to the different themes, it was found to be homogeneous, with slightly more MJ in Respect of the Environment for the dilemma of inadequate disposal of solid waste and slightly more MJ in Disrespect of the Environment for polluted waters (Figure 4).

Moral Judgements in Disrespect of the Environment increased in the thirteen to fourteen age group, to the detriment of MJ in Respect, which has to be associated with moral development itself (Table 3).

The considerable presence of subjects in the MJ Environmental Respect/Disrespect category (31.9%) has to be associated with the affectivity they demonstrate during conflict situations (dilemma) involving elements to which they attribute value; for example, the need for a family member to have a job. In this case, when a child is asked about whether or not a factory should be built,

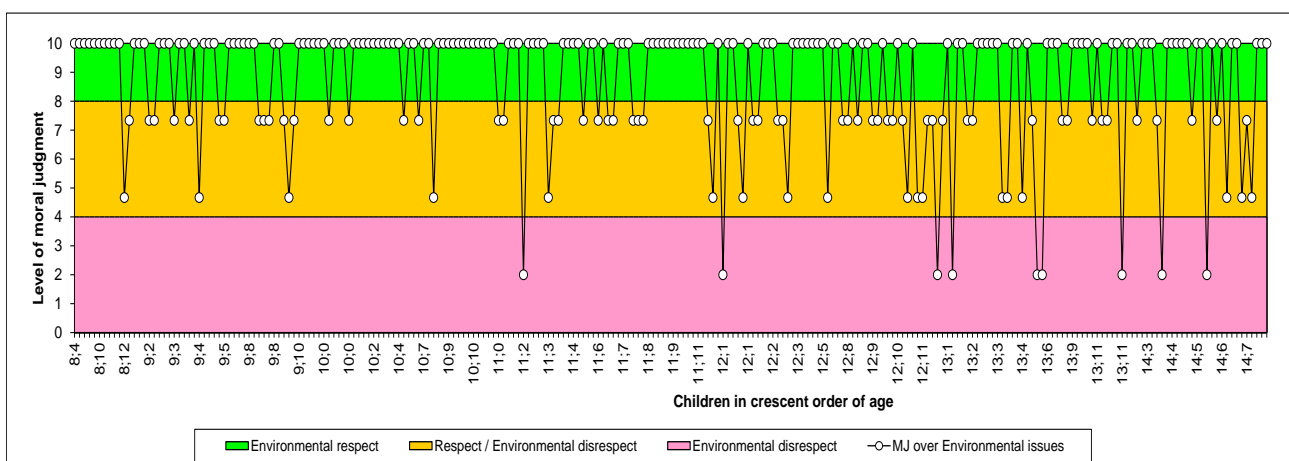


Figure 3. Types of environmental moral judgements.

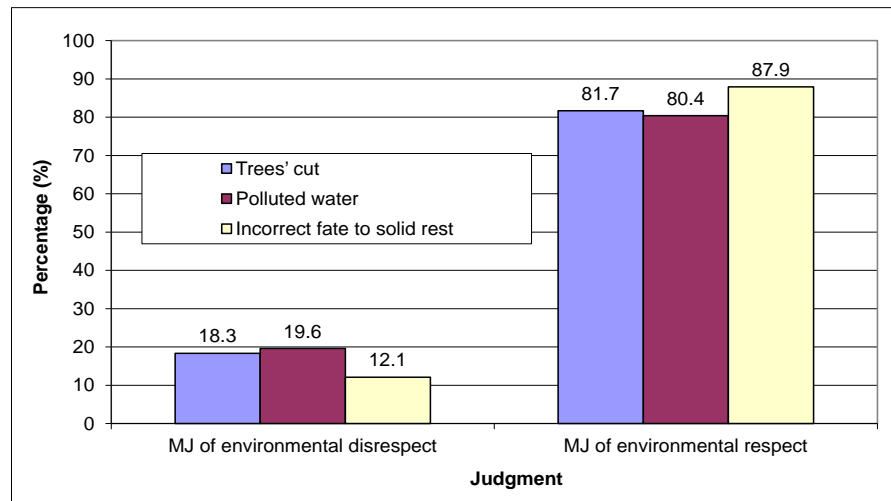


Figure 4. Children and adolescents' types of environmental moral judgement.

Table 3. Types of environmental MJ by age group.

Age	MORAL JUDGEMENT OF ENVIRONMENTAL ISSUES							
	Environmental Respect		Environmental Respect/Disrespect		Environmental Disrespect		TOTAL	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
8 - 10 years	65	76.5	20	23.5	0	0.0	85	100
11 - 12 years	51	59.3	33	38.4	2	2.3	86	100
13 - 14 years	40	58.0	22	31.9	7	10.1	69	100

which would generate employment but would pollute the river, the child gives a moral judgement in favour of building the factory because this is the most outstanding need, even though the pollution of the water would affect many people.

The occurrence of indices of Moral Judgement in Disrespect of the Environment in relation to the issue of tree felling, at School B1, may be associated with the reality faced by the children and adolescents at this school. It has no sports ground for Physical Education lessons and this may have influenced the students' Moral Judgement in Disrespect of the Environment.

We found the best indices of Moral Judgement in Respect of the Environment at Schools D and A. We noted that conflicts between students at School A are discussed by the teachers and by the class in the form of specific meetings. Teachers do not use expiatory punishments as they believe that punishing students does not alter their behaviour regarding environmental issues. This may be contributing to the existence of cooperation and, consequently, to mutual respect, as it requires reciprocity and principals of justice. This behaviour can be explained by the operational teaching concept developed at the school, as the teachers and their teaching practices were seen to promote cooperative environments which enable students to develop autonomy right from the first years of primary education. This explains the presence of high indices of Moral Judgement in Respect of the Environment.

At School D it was evident that almost all children aged under eleven demonstrated Moral Judgement in Respect of the Environment. This is probably related to the relationship of interindividual coercion or the children's egocentricity, propagated by the heteronomous phase and made possible through unilateral respect.

In this school, as already mentioned, there are constant activities aimed at developing human values based on Christian principles. This would explain the results found.

Another relevant aspect to be highlighted is that despite School D having a philosophical concept of a religious nature, the Judeo-Christian conception of the world was made evident in the following words of one of the subjects interviewed:

- When you think about trees, do you think they have life? *Yes.*
- Why? *Because God created trees and they increase in size, they grow just like we do.* D.15 (10;2)

The divine explanation of the creation of nature is referred to very little by the children when analysing the issue of trees, although the understanding of the world based on religious knowledge may have explained nature as God's creation and as a pure and perfect work, as stated by Brailovsky (1992).

In keeping with Piaget (1977: p. 313), building rules through mutual agreement and cooperation becomes rooted within the child's conscience and leads to an effective practice, as cooperation constitutes "the system of interindividual operations", i.e., the operational clusterings that enable individuals' operations to adjust to each other. Individual operations "constitute the uncentred actions susceptible to coordinating themselves into clusters that encompass other people's operations", as well as one's own operations.

It is also appropriate to say that this oscillation, which may be the result of the process of moral development in relation to environmental issues, could be an intermediate and imbalanced stage between heteronomy and autonomy. Values operating with heteronomy are conditioned by agents that exert coercion and environmental moral judgement is determined by this context. However, when children and adolescents evolve and attain autonomy, they judge based on values.

Heteronomous children may demonstrate both environmental respect and disrespect, owing to the imposition caused by coercion made possible by unilateral respect (regardless of their parents' wishes). Contrary to this, there are children who despite building very clear moral rules in relation to the environment, in certain situations, such as at school, they are not coerced by the teacher because he or she does not exert authority. As such, they tend to disrespect rules and not respect the environment, regardless of whether the teacher is present or absent. This occurs owing to the phase of transition from heteronomy to autonomy when children begin to reflect about social rules and no longer simply comply with them. This is why when they are in a coercive environment where

rules are imposed, they tend not to obey them because they are beginning to coordinate their own points of view.

We agree with Piaget (1973: p. 108) that conditions of equilibrium result in the constitution of a form of logic only in certain types of exchange which can be defined from the term of cooperation, being the opposite to exchanges diverted by a factor, whether this be egocentricity or coercion. As such, "equilibrium cannot be achieved when, owing to intellectual egocentricity, the partners are not able to coordinate their points of view". This is also related to cooperation with the environment and nature.

4. Conclusion

The environmental knowledge of the children and adolescents, in general, is preliminary and intermediate, i.e. they do not have systematized understandings of the interrelations between the elements of the environmental system and many of them do not demonstrate knowledge of the constitution of different types of matter present in the environment.

The majority of the children and adolescents studied show moral judgement in respect of environmental themes, as well as cases of moral judgement in disrespect of the environment regardless of their age.

The environmental knowledge of the children and adolescents, differently to their environmental moral judgement, showed a moderate tendency to increasing as they became older, between eight and fourteen years old.

Moral Judgement in Respect of the Environment is extremely social, since children and adolescents need to understand the environmental system as an integrated totality and that actions in the milieu cause changes in the environment. The notion of cooperation is fundamental in relation to the environment, since thinking about the environment means thinking about collectivity.

Despite environmental knowledge and Moral Judgement about environmental issues not being determinants, they are implied, principally from eleven years of age onwards, given that both result from the social interaction of individuals in the environment.

As such, we can affirm that social factors, including the transmission of education (family and school context), and social interaction impose respect for the environment as rules to be obeyed. These rules are reinforced in environmental education practices. In this way, in general, heteronomous children express moral judgements in respect of the environment.

We believe that not always what children think correct is what they would do in real situation. Therefore, the results of Environmental Moral Judgment presented in this paper should be used only as an indicative of judgment of environmental issues and not of the actions of children and adolescents in the environment, since the judgment exerts influence, but does not determine their action.

Therefore, the answer to the research problem, that children and adolescents act to intensify or cause environmental problems, even if they are aware of the

causes and consequences of environmental problems, is due to several factors: they do not attribute a value to the environment. Sufficient to become aware of their actions, because of the level of knowledge and practice of autonomy, among other factors.

Environmental awareness involves coordination of logical operations, cooperation, moral judgment, and affection. **Figure 5** seeks to exemplify how environmental awareness is constituted.

Finally, we emphasize that, in order to have an Environmental Moral Judgment in children and adolescents based on the intentions of their actions, in a respectful and subjective way, it is necessary that the school environment be cooperative, allowing them to exercise autonomy, development of affectivity and knowledge of environmental issues.

The practice of Environmental Education should promote activities that lead children and adolescents to reflect on moral dilemmas of local environmental problems through experiences with the use of concrete materials. Therefore, considering the environmental dimension in the Environmental Education proposal means explaining the changes in the environment, purpose and quantity of life in the short and long term. The use of the environmental dimension approach in Environmental Education proposals provides a breakthrough.

The greatest difficulty found in the study was to identify the types of knowledge and environmental judgment of children and adolescents.

We emphasize the need for future studies to analyze the interference of

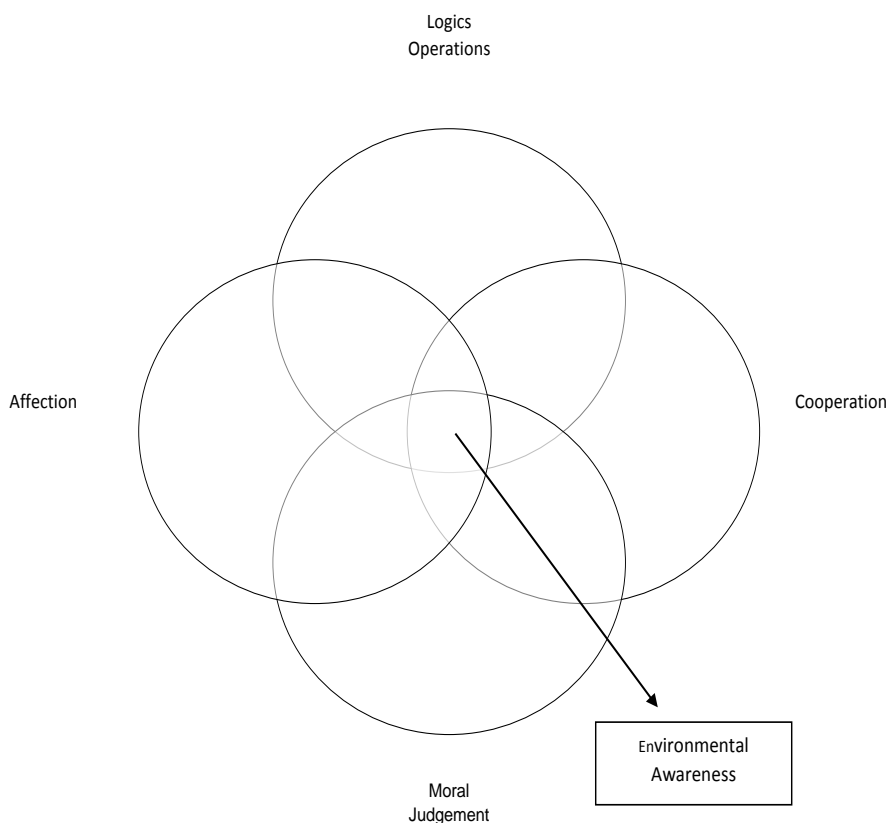


Figure 5. Environmental awareness. Source: Vestena (2011: p. 163).

affectivity in the process of constitution of environmental moral judgment, as well as to evaluate the psychogenesis of environmental moral judgment.

References

- Brailovsky, A. E. (1992). *Esta, nuestra única Tierra: Introducción a la ecología y medio ambiente*. Argentina: Ediciones Larousse Argentina.
- Brasil. Lei n. 9795 de 27 de abril de 1999. (1999). *Dispõe sobre a educação ambiental, institui a Política Nacional de Educação Ambiental e dá outras providências*. Brasília: Diário Oficial da República Federativa do Brasil, n. 79, 28 abr.
- Brasil. (2002). *Decreto n. 4281 de 25 de junho de 2002. Regulamenta a Lei 9795 de 27 de abril de 1999 (...)*. Brasília: Diário Oficial da República Federativa do Brasil, n. 121, 26 jun.
- Brasil. (2012). *Ministério de Educação. Conselho Nacional de Educação. Resolução n. 2, de 15 de junho de 2012. Dispõe sobre as Diretrizes Curriculares Nacionais para a Educação Ambiental*. Brasília, DF: D.O.U., 15 jun. Seção 1, p. 18.
- Delval, J. (2002). *Introdução à prática do método clínico: Descobrimos o pensamento das crianças*. Porto Alegre: Artmed.
- Organização Para Cooperação E Desenvolvimento Econômico (OCDE) (2009). *Programa Internacional de Avaliação de Alunos—PISA*. Brasília.
- Parrat-Dayán, S. (2000). A Teoria de Piaget sobre a Causalidade. In M. Moreno, G. Sastre, M. Bovet, & A. Leal (Eds.), *Conhecimento E Mudança: Os Modelos Organizadores Na Construção Do Conhecimento* (pp. 15-37). Campinas: Moderna.
- Piaget, J. (1973). *Estudos Sociológicos*. São Paulo: Forense. (Études Sociologiques. Genève: Droz, 1965).
- Piaget, J. (1977). *O Julgamento Moral Na Criança*. São Paulo: Mestre Jou. (Le Jugement Moral Chez L'enfant. Paris: F. Alcan, 1932).
- Piaget, J. (1978). *Fazer E Compreender*. São Paulo: Melhoramentos (Réussir Comprendre. Paris: Puf. 1e Éd., 1974).
- Piaget, J. (1979). *A Noção De Tempo Na Criança*. Rio De Janeiro: Editora Record. (Le Développement De La Notion De Temps Chez L'enfant. Paris: Presses Universitaires De France, 1946).
- Piaget, P. (1983). *A Psicologia Da Inteligência* (2nd ed.). Rio De Janeiro: Zaha. (La Psychologie De L'intelligence. Paris: A. Collin, 1947).
- Vestena, C. L. B. (2011). *Piaget e a questão ambiental: Sujeito epistêmico, diagnóstico e considerações educacionais*. São Paulo: Cultura Acadêmica.

An Emerging Model of E-Learning in Palestine: The Case of An-Najah National University

Saida Jaser Affouneh^{1*}, Ahmed Amin Awad Raba²

¹E-Learning Centre, An-Najah National University, Nablus, Palestine

²College of Education and Teacher Training, An-Najah National University, Nablus, Palestine

Email: *s.affouneh@najah.edu, ahmedm@najah.edu, ahmedawad_amin@yahoo.com

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Abstract

An-Najah National University (ANU), a Palestinian non-governmental public university located in Nablus in the northern part of Palestine, serves 17,807 students with 1020 professors in 11 faculties, and has been striving to integrate technology in its systems to keep up with the global flux of change in all aspects of life. For 10 years An-Najah has pursued the integration of e-learning in residential, blended and fully online delivery. Following a brief summary of the history of An-Najah National University, change management strategies are featured, highlighting specific successful techniques. The case study concludes a description of the change management model that emerged in addition to indicators of a great impact on students' satisfaction and staff members' participation ratios.

Keywords

Blended Learning Model, Strategic Planning, Change Management, E-Learning, Synchronous

1. Introduction

ANU was established in 1977 and has emerged as the largest university in Palestine, as well as Palestine's leader in higher education. ANU is a public university that is supervised by a Board of Trustees. The university has over 17,807 students and 1020 professors in 11 academic faculties. ANU offers both undergraduate and graduate degrees.

ANU aspires toward improving the quality of its graduates through enhancing technology in teaching and learning (ANU, 2011). Over the last ten years, it moved toward excellence in teaching and learning, and improved its reputation not only in the Arab world but also among international higher education institutions with a clear vision that indicates dedication to promoting understanding,

providing the highest quality undergraduate and graduate education, and serving as a leader in the scientific research. ANU acts as a base for sustainable development by encouraging students and the University community to assume leadership roles and to participate in serving the society (<http://www.najah.edu/page/2674>).

ANU has effectively participated in many e-learning projects, and its faculty members have designed pilot-blended courses, especially in the faculties of engineering, education, and information technology. In 2010 ANU published more than 120-recorded lectures as a prelude to its institutional staging of an e-learning strategy. In 2012, the e-Learning Center was established under the supervision of the vice president of Academic Affairs and the director of pedagogical affairs. Six technicians were employed for this purpose, and two instructional designers are currently working at the center on a part-time basis. A strategic committee for e-learning was formed whose main responsibility is to set rules and regulations for the center, and to follow up the university's transition into e-learning. The committee usually meets twice per semester. The University Computer Center, responsible for the administration of the learning management system, also recognized the need for the e-Learning Center and supported the initiatives. From the aforesaid effort, it is noticed that the researchers aimed to document the university willingness to integrate technology in its systems for all the faculty members.

2. Statement of the Problem

One of the main barriers to any change management strategy is managing the human dimension of acceptance and resistance. A significant obstacle to the integration of technology into education at ANU was the faculty members' resistance to considering new teaching techniques. Many faculty members preferred to use their old traditional methods of teaching. This may be due to either the faculty members' lack of instructional technology skills, or to the lack of significant understanding of the importance of e-learning and its impact on the quality of instruction (Mallinson & Krull, 2013). This phenomenon of resistance to the new teaching techniques was identified in many other e-learning initiatives and could significantly impact progress of the integration of technology into teaching practices as admitted by Moershell (2009) who also added another point in this regard which is the specific culture of the institution which can play a role towards reinforcing the resistance, in correlation with the individual's nature of the employees, which tend to be uncooperative.

The majority of resistance literature is focused on its causing factors, specifically the adoption of online learning. Berge and Muilenburg (2001) identified 64 barriers or factors of resistance to distance education that were grouped into 10 factors. Harvey and Broyles (2010: p. 112) identified 20 factors of resistance and pointed out the antidotes to them.

3. Methodology

This research project used primarily a qualitative approach including data

collected through three main instruments, interview protocol, observations and analysis of supporting and related documents. This study was developed with reliance on input collected in the form of interviews with students, deans, faculty members, and decision makers at ANU. Ten of the interviews were conducted in order to understand the vision of the university towards e-Learning. These interviews were conducted with university president, and Deans of faculties at the university. Each interview was open and lasted for one hour. What distinguished each interview was the concentration on the university policy, understanding and attitudes of the University for ELearning, its readiness for eLearning, obstacles and opportunities were also discussed. As the main author who is the director of eLearning center and the responsible person for capacity building of faculty members in eLearning, she was able to observe the training sessions and took notes of the faculty members who participated in the training and recorded their comments, practices and attitudes.

Analysis of policy document such as the University's strategic plan, e-learning Center reports and surveys, as well as the minutes of e-learning workshops and meetings was also conducted. Finally, the lead investigator's observations and daily experiences as the director of the e-Learning Center were also captured and reviewed as a historical log of events. Understanding the principal investigator was also a stakeholder in the change management process is one limitation of this research approach. The model is presented for consideration by other similar institutions undertaking this or related change management initiatives. **Figure 1** illustrated the whole methodology section which is a representation for NNU emerging plan.

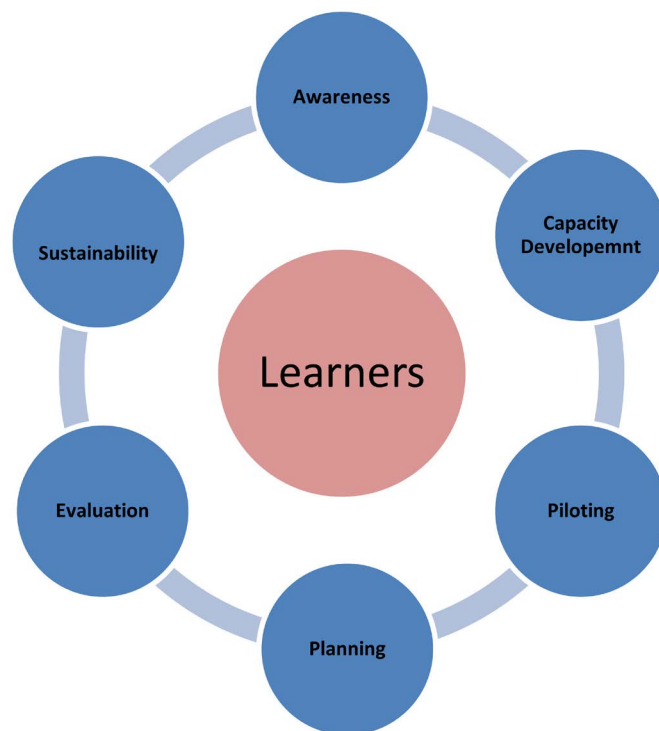


Figure 1. Emerged model.

4. Developing an E-Learning Strategy

As stated by Haugen (2004), E-learning projects are mostly without an effective pedagogical approach, which can reduce the potential of the learning process. Being an online teacher requires a lot of reflections on how to construct and run the course over the Internet. Many higher education institutions have not experienced the full potential of e-learning because the initial initiative overemphasizes the use of technology rather than the pedagogical advantages. Often, in these initiatives, little attention is given to change management strategies (Mackenzie-Robb, 2004). Initiating a plan for e-learning and developing a model customized to the culture and history of ANU was a difficult and iterative process. Critical success factors had to be identified (Engelbrecht, 2003) and challenges had to be discussed. The use of ICT (Information Computing Technology) had to be integrated into all levels of university management and processes in order for the strategy to conform to and fit the culture and vision of the university. This vision was reached after raising many questions and discussion took place in order to describe the future of e-learning at ANU. Some of these questions were:

- Why does ANU need e-learning, to what outcome?
- What form of e-learning suits our learner as well as our system?
- How does ANU define e-learning?
- Does ANU's vision fit a national strategy supporting e-learning in Palestine?
- Is e-learning visible and supported in ANU's strategic plan?
- Are there any national regulations that may impact e-learning at ANU?
- What are the best practices in e-learning?
- Are the units to be impacted by e-learning at ANU ready for e-learning?
- Are faculties' members and students ready for change brought on by e-learning?
- Do we need to introduce an incentives program to stimulate the adoption of e-learning?
- Can change happen quickly at ANU in regard to the introduction of e-learning?
- Which is the best model for change management around this initiative?
- What are the main challenges and threats to e-learning?
- Are other departments already supporting e-learning at ANU?
- How can we document and record our change management experience?
- How many students should be enrolled in each e-learning course?
- Do we need virtual spaces for synchronous meetings?

Many of the above-mentioned questions were answered. A few were still under discussion and in need of additional time and research in order to arrive at the most suitable approach. Lessons learned from the change management experience continued to influence forward progress. Capturing the most appropriate practices for ANU continued and would be disseminated in the coming few years. Plans were also being developed to gauge the impact of e-learning on learners' achievements and students' motivation.

A clear and concise vision for the e-Learning Center was developed through interviews, discussions, and roundtables with learners, faculties' members, deans, and decision makers. The e-learning integration plan was articulated in a vision statement that sought to "integrate information and technology into learning in order to reach a highly competitive quality of teaching and learning outcomes among universities, national and international communities, and hence brought further knowledge to societies about the benefits of e-learning" (ANU, 2016).

Eight main goals were developed in order to achieve the vision of e-learning:

- 1) To arrive to a high-quality education in both learning and teaching, in order to achieve the best education.
- 2) To compete locally and globally with the higher education institutions.
- 3) To meet the changing needs of today's learners.
- 4) To improve the environment of e-learning.
- 5) To improve the quality of e-learning outcomes.
- 6) To enhance the capacity of instructors and learners in pedagogy.
- 7) To increase awareness towards e-learning.
- 8) To design high-quality blended courses.

These goals were the result of a SWOT analysis at ANU. The SWOT analysis was conducted with senior staff of the university through which, the strengths, weaknesses, opportunities, and challenges of ANU were analyzed and discussed with senior management level and with faculty members. Many strengths were identified through the initial conducted SWOT analysis. One critical strength was the awareness and readiness of the senior management at ANU to recognize the importance of integrating technology into teaching and learning. This was not strictly for the sake of the use of technology but rather for two important reasons: First, senior management recognized that the technology and information revolution had affected all aspects of higher education, and that ANU had the responsibility for their students and faculties to empower the ANU educational system with appropriate technology in order to be part of the digital world. Secondly, ANU was working toward excellence in teaching and learning and was hence concerned with its international reputation. For these reasons, the university desired to enhance the quality of instruction according to international quality standards. This enhancement would be achieved by utilizing different tools and strategies in teaching and learning to meet the needs of its learners and prepare them for today's workplace.

The SWOT analysis also revealed tremendous e-learning opportunities at ANU. These included many dimensions, such as: the technological infrastructure of the university, especially evident in the new campuses design and construction. These opportunities increased in prominence with the emergence of a strategic plan that had already adapted e-learning into its strategic goals. Four of the main goals of ANU's strategic plan reinforced the importance of e-learning; namely:

- Provide ongoing training for faculty members on modern teaching methods.

- Train faculty to use information technology in the educational process.
- Encourage e-learning as a means of reinforcing the educational framework.
- Implement regulations and instructions consistent with international quality standards such as Quality Matters.

This comes in addition to the previous experiences of many faculty members who have already participated in projects aiming at the design of online courses.

One of the main weakness or threats to this e-learning initiative was the resistance from faculties' members to the use of modern methods of teaching and learning and a shift toward a more learner-centered approach. An additional threat was the lack of national rules and regulations for e-learning in Palestine. The limited financial resources also posed a major weakness at both ANU and at the national levels.

5. The Emerging Model for E-Learning at ANU

In arriving at this new model, Tony Bates' model of planning for e-learning was reviewed, which proposed that the transformation into e-learning undergoes five consequential stages:

- **Stage 1** "Lone Rangers" (Bates, 2000): These are the early adopters of e-learning. In their approach, e-learning is introduced through the initiative of individual faculty members or instructors, often with no immediate or direct support from the institution.
- **Stage 2** Encouragement: The activities of the early adopters attract the attention of senior administrators, who try to support them with small grants or a slightly reduced teaching load.
- **Stage 3** Chaos: After a period of time, a growing number of instructors embrace e-learning, but the administration begins to feel worried about issues of quality, duplication of effort, and lack of technical standards, such as the need to support different course development platforms, and above all, the costs of scaling up to large numbers of classes and instructors.
- **Stage 4** Planning: The senior administration realizes that priorities need to be set, common technical standards established, technical, design, support and training for faculty or instructors developed, and hence locating the most cost effective ways of developing e-learning so that both the budget and instructor workload can be controlled.
- **Stage 5** Sustainability: The institution has established a stable system of e-learning that is cost effective and scalable. Few institutions to date have reached this stage." (Bates, 2007: p. 48)

The above model was studied and adopted as an initial frame with which to initiate the e-learning model. Following the SWOT analysis, a vital concern emerged: if ANU reaches the third stage of chaos based on the authors of previously documented experiences, there will be a great danger of not being able to move out of it. Therefore, a new model was designed with modifications to the model posed by Bates. The model is nick-named "Go with the horse that pulls". This model involves six phases:

5.1. Raising Awareness

The first and most important phase is to raise awareness and to deploy an e-learning culture. This phase began with a structured orientation. Sixteen workshops in different faculties were conducted to answer the questions of why should e-learning be adopted? What does it mean? and are we in need of e-learning? 90% of each faculty members participated in each workshop. Calvo & Rungo (2010) in this regard emphasized the importance of the consensus of the institution in agreeing on the purpose of e-learning, for the purpose of building common understanding. As an initial step, a draft working paper was developed with suggested definitions for different conditions, and a workshop was held with the participants who included initiators, deans, directors, and vice presidents at ANU. Online learning, blended learning, enabled learning, synchronous learning, asynchronous learning, instruction design, multimedia, and learning management systems were discussed, and definitions for each were agreed upon. As a result, blended and enabled learning were chosen to be the most appropriate models for e-learning at ANU.

Blended learning was defined as the ability to deliver learning as both online and face to face with the percentage of 75% face to face and 25% online. All the course content would be designed online after being assessed. While enable learning mode was defined as the use of technology for communication between learners and their instructors in various ways, and a portion of the course content would be online. The above definitions were used specifically for this model at An-Najah National University.

Excellence in teaching and learning was the terminology used to express the university policy, despite the delivery method whether electronically or face to face. Many studies referred to this approach (Fee, 2009: p. 13) and concluded that e-learning should not be distinguished from learning since it is simply another form of learning and consider it as a tool not a goal in itself. Questions arose as to whether e-learning was seen as supplementary or as a replacement to the traditional standards of teaching, and it was collectively agreed that e-learning should be integrated into learning based on content, learners' needs, and the wishes of faculty members. Manuals, brochures, Web Pages and a Facebook page were developed for this purpose. Based on the workshops evaluation sheets, faculties' members held positive attitudes toward e-learning, and the process continued.

5.2. Capacity Development

As emphasized by Rosenberg (2007), this phase is the heart of change management having the right technology, the best content and skillful employees will not lead to success in e-learning. Faculty members, staff and deans are the key factors for successful transition, and it is essential to train them to become competent e-learning facilitators (Engelbrecht, 2003: p. 38).

The philosophy behind the program involved beginning with aspiring individuals and leading young faculty members as the first adaptors of e-learning.

Training workshops were optional and upon request. All training material entailed three themes: technical, pedagogy and spiritual aspects of e-learning, the entirety of which were developed in a way that concentrates on the knowledge, skills and attitudes of faculty and participants toward e-learning, which was viewed as key to moving forward. Best practice in adult learning was implemented where active learning strategies were implemented. The design of the program enables each faculty member to decide and choose how much they need to learn, and how much they want to learn. The program offers different options for learning, such as face-to-face workshops, self-running training courses, one to one training and peer-to-peer sessions.

Resistance to the model was ignored and instead a “go with the horse that pulls” strategy was emphasized. This strategy inhibits any unfruitful dialogue or discussion that may lead to nowhere in the e-learning process. Nonetheless, the opinions of faculty members were respected; but opponents to the model were informed that support would be given to them upon their request, when they feel they are ready to engage in e-learning. Success stories were deployed and discussed in the form of roundtables. An Incentives system was created and implemented, which included example rewards, acknowledgments, and various ceremonies. The idea was to encourage faculty members and to show them the benefits of e-learning, without putting pressure on them. After each workshop, more faculty members began to integrate technology into their teaching methods, which occurred in different levels and manners, such as in the form of self-directed pathways, and independent learners. [McQuiggan \(2012: p. 32\)](#) considers this as an important issue, especially among adult learners.

Training was not focused on how to teach online courses only but also on locating the best practice in teaching face-to-face, since teachers usually teach as they were taught, and training workshops were considered as an opportunity to learn about modern teaching strategies ([McQuiggan, 2012](#)). All training courses were developed upon the feedback received in the reflection sessions, which bore in mind the perspectives of participants, in order to meet their needs. Different faculties proposed different needs and strategies. All training workshops were limited to 25 participants each, in order to give opportunities for discussion, two moderators led each workshop.

By the end of the first year (2013), 35% of faculty members were successfully trained on instructional design, moodle, social media, active learning, e-learning ethics, and authentic assessment, while over 70% of faculty members participated in the e-learning orientation workshops. As indicated in the evaluation sheet of the training workshops, over 80% of participants were satisfied with the training and have expressed a desire to participate in further advanced training workshops ([e-Learning Center, 2013](#)). One important indicator of success was the shift from calling for the conduction of trainings from our side, to preparing training workshops upon the request of faculty. This shift was initiated by the faculty of engineers, where 25 faculty members participated in an all-day workshop during their weekend.

And by the end of year (2016), 82.1% of faculty members were successfully trained on instructional design, moodle, social media, active learning, e-learning ethics, and authentic assessment (e-Learning Center, 2016).

5.3. Piloting-Designing and Implementing Blended Courses

This phase began with a call for faculty grants by the center for excellence in teaching and learning which the e-learning center worked cooperatively with. Fourteen courses were selected to be designed online and implemented as blended courses under the supervision of e-learning, excellence in teaching, and learning centers. The remaining 31 courses were designed, implemented, and evaluated according to specific criteria. **Table 1** reveals the number of developed courses in the last year.

By the end of the second semester of the year 2015-2016, 1062 courses were designed, 121 courses were evaluated and taught as blended courses, while the rest are enabled courses through which the teacher can use moodle as an interactive learning environment in order to involve students in their learning process, which will be conducted in the form of forums, e-assignments, and quizzes.

Four courses were chosen as models to be accessed by faculty members in the training workshops. A team consisting of an instructional designer, a multimedia specialist, and a subject matter expert worked together to develop each course. The roles of each of the faculty members differed from one course to another according to the background of the subject matter expert and his interest in e-learning. In assigning these roles, more attention was given to the quality of the designed courses so as to raise the standards accepted by the second generation of e-learning designers.

5.4. Planning

A three-year action plan was developed which described the aims, activities, needs, and timeframe of the e-learning process and responsibilities. By the end of the third year, all faculty members would have been trained in e-learning, while reflecting on their traditional ways of teaching, thus enabling them to practice a new strategy of modern teaching that concentrated more on the needs of the learners, as well as on real life experiences, and technology would be suggested as an optional choice for them.

A variety of resources must be allocated for e-learning, as the first year of

Table 1. Online course distribution.

Courses /year	2011-2012 2 nd semester	2012-2013 1 st semester	2012-2013 2 nd semester	2013-2014 1 st semester	2013-2014 2 nd semester	2014 -2015 1 st semester	2014-2015 2 nd semester	2015-2016 1 st semester	2015-2016 2 nd semester
Moodle	14	42	265	325	390	575	693	892	1062
Video recorded	136	156	169	190	200	217	231	243	259

working with e-learning was with limited resources, which included the volunteering of all committee members in order to support the university in its transformation stage. Today, the e-Learning community is increasing gradually within the university, and the culture is quickly moving from one faculty to another through peer-to-peer support.

5.5. Assessment and Evaluation

An evaluation committee was formed for the purpose of evaluating the blended courses. The committee consisted of five members from different disciplines who have previous experience in evaluation, and have already designed taught blended courses. The committee began its tasks with developing their own evaluation criteria, which was carried out after studying and analyzing the available international criteria for assessing the quality of e-learning courses. These included the Penn State quality Assurance Standards and the Sloan Consortium scorecards for online courses.

The main themes of the criteria developed were the general layout and organization of the course; the intended learning outcomes related to course content; learning resources; language used; learning strategies—learner centered approach, accessibility and finally evaluation and assessment tools.

As part of this process, 121 courses were evaluated, and feedback was given to teachers and designers, while courses were improved upon the recommendations of the evaluation committee. The committee considered the evaluation aspect of the program as a learning process, since many issues arose during this process, which were negotiated throughout the discussions. One of the main important lessons learned from the observations of the committee was common misuse between the objectives and the intended learning outcomes among faculty members. As a result, a training workshop was established specifically for faculty in order to develop their skills in managing and designing their syllabus.

5.6. Generalization and Sustainability

An-Najah National University looks forward to reaching this stage in the coming three years, as clearly indicated in its e-learning plan. One big indication that shows the university's strive in this regard was the establishment of the e-Learning center which is responsible for following up the spread of eLearning for all the faculties. Besides, this centre is also responsible for capacity building of all staff members, administrative staff and students as well. A strategic plan for eLearning was developed and discussed and approved by the university policy makers. Resulting from the efforts of the e-learning centre at ANU willingness to integrate technology has been shown in the great number of courses that are run on the moodle. **Figure 2** shows the increasing number of the distribution of e-courses per semester since the beginning of emerging e-learning.

6. Qualitative and Quantitative Indicators of Success

Table 2 shows all the events, training sessions, exams, the construction of

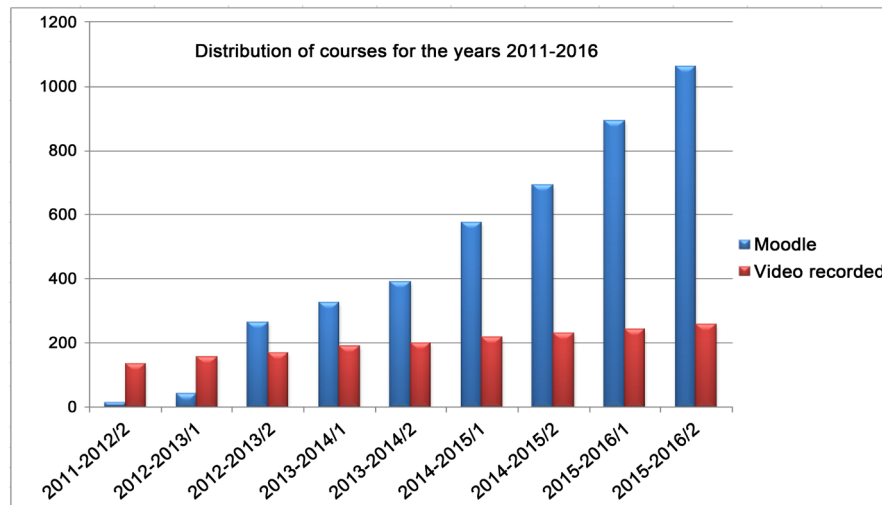


Figure 2. Distribution of courses per semester.

Table 2. Success indicators of the emerging model from 2012 until end of 2016.

Indicator	Analysis	Description
The percentage of Learners' positive attitudes toward e-learning raised from 65% to 80%	A pre-online survey was conducted in September 2012, and a post-survey was conducted in April 2013.	Between 2012 several orientation workshops for learners were conducted, and many of them were enrolled in Blended courses
82.1% faculty members participated in 81 training workshops	Different topics such as moodle, instruction design, social media, evaluation, and active learning were incorporated into these workshops.	The workshops delivery mode used best practice in training concentrating on participants' previous background.
287 courses were developed as blended courses	The ratio of the e-learning aspect of each course differs between faculties.	Course content was all developed online but the delivery mode differs according to the instructor and type of course, and learners' needs.
Teachers' qualification diploma was designed and offered partially online. The diploma consisted of 14 courses.	This diploma was offered in cooperation with the Ministry of Education, and it was one of the first programs that offered blended courses. It is expected to participate in raising the awareness of school teachers toward e-learning, and to improve their IT skills.	In the diploma external evaluation this issue was considered to be a privilege for our university.
500 short-session trainings were conducted for learners	At the beginning of each course, learners were offered training on how to use moodle and online exams.	Learners' computer skills were better than faculty members' skills since they were digital generation
A policy for conducting online exams was agreed on and up to 30% of learners' final scores could be computerized exams or online assignments	The evaluation system in the university was developed to match the new method of teaching.	Paper- based exams were used to be the most popular method used for evaluating learners' achievements.
81 orientation sessions were conducted to raise the faculty members' awareness toward e-learning	In each faculty, a workshop was conducted with the participants of all faculty members and technicians.	This was to discuss e-learning concepts, advantages and the impact of technology on education.
85% of the University learners were enrolled in the moodle	They participated in blended courses or enabled courses.	
A website for e-learning Center was developed	http://www.najah.edu/ar/elearning	
A Facebook webpage was created for any technical support for faculty members and learners	https://www.facebook.com/elc.nnu	

(ANU, 2016)

e-courses along with incentives and awards being offered by the university to be as main indicators of the university emerging model from 2012 until end of 2016.

7. Conclusion and Future Interventions

ANU is seeking to become a leader of blended learning in Palestine, and to develop a suitable learning environment for itself in both the real and virtual worlds. This paper presented the ANU experience of managing its shift to e-learning, and reported on its model in e-learning as a new and emerging one. Strengths and weaknesses were discussed, and future interventions were also explained. As planned for the future of e-learning at ANU, further research should be conducted to measure accurately the impact of e-learning on improving the general learning environment. Faculties at the university expressed a strong commitment to e-learning in different ratios, while some of them were still in need of further encouragement. Additional financial support is needed to be able to continue the work and to achieve the university's excellence. Cooperation and support from different university units, centers, and faculties empowered the center of e-learning at ANU, and the center hoped to continue to receive such support and encouragement in order to achieve its objectives, and to establish a larger, more cohesive e-learning society in all parts of Palestine.

Acknowledgements

This research is dedicated to the memory of Bruce Chaloux whose encouragement and inspiration are the reason behind developing it. I first met Bruce in 2011 during teaching and learning conference held by An-Najah National University and Amideast, and since then he has continuously supported my efforts in establishing the e-learning center at An-Najah National University. His passing comes as a great loss to the entirety of online higher education systems across the world, and I will continue to follow through his footsteps in order to pursue his research and objectives in the fields of online learning.

References

- An-Najah National University (ANU) (2011). *Strategic Plan 2011-2016*. Nablus: ANU.
- An-Najah National University, E-learning center plan (2013).
- An-Najah National University, E-learning center plan (2016). *E-Learning Center Plan. The First Year Report of e-Learning Center*.
- An-Najah National University (ANU). Official Website: <http://www.najah.edu>
- Bates, T. (2007). *Strategic Planning for E-Learning in a Polytechnic*. Tony Bates Associates, Ltd. Canada. <https://doi.org/10.4018/978-1-59140-950-2.ch004>
- Berge, Z., & Muilenburg, L. (2001). Obstacle Faced at Various Stages of Capability Regarding Distance Education in Institutions of Higher Education: Survey Results. *Tech-Trends*, 45, 40. <https://doi.org/10.1007/BF02784824>
- Calvo, N., & Rungo, P. (2010). Analysis of Emerging Barriers for e-Learning Models: An Empirical Study. *European Research Studies*, V. XIII, (4).
- Engelbrecht, E (2003). A Look at e-Learning Models: Investigating Their Value for Developing an e-Learning Strategy. *Progressio*, 25, 38-47.

- Fee, K (2009). *Delivering E-Learning A Complete Strategy for Design, Application and Assessment*. Kogan Page. London and Philadelphia.
- Mackenzie-Robb, L. (2004) *E-Learning and Change Management—The Challenge*. Vantage Ltd. England.
- Mallinson, B., & Krull, G. (2013). Building Academic Staff Capacity to Support Online Learning in Developing Countries. *Journal of Asynchronous Learning Networks*, 17, 63-72.
- McQuiggan, C. (2012). Faculty Development for Online Teaching as a Catalyst for Change. *Journal of Asynchronous Learning Networks*, 16, 27-61.
- Rosenberg, M. (2007). *The Handbook of e Learning Strategy* (edited by B. Brandon). Santa Rosa, CA: The eLearning Guild.



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Research on Skill Testing Standard of Marketing Major of Wuhan City Vocational College

Hui Li*, Huijun Chen

Department of Finance and Economics, Wuhan City Vocational College, Wuhan, China

Email: *15377015817@163.com

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Abstract

Higher vocational education scale expands rapidly in the recent years, followed by the contradiction between expansion scale and education quality, which has become increasingly prominent nowadays. In order to improve the teaching quality, the most important is to improve daily teaching activity of the harmonious combination of teaching quality monitoring and evaluation system, which focuses on the teaching quality in higher vocational colleges through monitoring and the objective requirement of the long-term quality assurance mechanism. Based on investigation and analysis of present situation, analysis of professional practice skill testing of students majoring in marketing of Wuhan City Vocational College, we develop skill-testing standard in the hope of improving students' marketing professional skills in future.

Keywords

Higher Vocational Colleges, Marketing Major, Skill Testing Standard

1. Investigation and Analysis of Practical Skills Status of Students Majoring in Marketing of Wuhan City Vocational College

Higher vocational education emphasizes the cultivation of students' practical skills to provide the practical talents for enterprises need (Zhu, 2015). In order to better solve the problems of present professional practice skills situation of students majoring in Marketing of Wuhan City Vocational College, our research mainly adopts online questionnaire survey, field interviews, telephone interviews and etc. The questionnaire is attached as appendix in the end of this article with survey results. Our research is based on students majoring in Marketing in Wuhan City Vocational College from grade 2014, grade 2015 and grade 2016. We

totally hand out 500 questionnaires and actually get back 486, recovery rate of which is 97.2%. Survey mainly involves 12 questions related to skill test, such as mode for course-appraisal, the effect of the current evaluation system, learning attitude towards practice skill at school, test mode you prefer when you finish your course, attitudes towards skill test, suggestion for percentage of students joining in skill test, mode and time for skill testing and etc. According to our survey, we can get conclusions as follows: Firstly, the common course—appraisal is still traditional such as closed-book exam and exam in class; secondly, our college students do show enough interest on practical skill testing, and most of students are positive towards practice skill at school; lastly, in order to meet the demand of students, we should improve details of practical skill test as soon as possible, such as percentage of students joining in skill test, mode and time for skill test. Therefore, implement skill test should be urgently needed to improve the teaching effect, thus, skill test standard needs to be developed.

2. Significance of Implementing Skill Testing in Wuhan City Vocational College

In view of the survey and analysis of students' professional practice skills of Wuhan City Vocational College, it is necessary to implement skill testing. First, it is necessary to attach importance to practice teaching of teachers because of a shortage of funds of school; second, some teachers still stay in the traditional teaching theory, who are not willing to participate in the practice, thus, their practical skills are poor. With the help of skill testing, school will increase investment in software and hardware, enhance college-enterprise partnership, strengthen teachers' training, supervise and urge teachers to improve practical skills of independent learning. Finally, students will naturally in the usual learning enthusiasm and initiative, so as to improve professional skills. Finally, through skill testing, more communication between colleges from different provinces and cities will be improved.

3. Literature Review at Home and Abroad

3.1. The Foreign Research Status

Foreign vocational education attaches importance to the cultivation of the students' ability and establishing a set of vocational education patterns, such as the CBE (Competency-Based Education) mode of the United States, dual system of Germany, TAFE (Technical And Further Education) mode of Australia, the GNVQ (General National Vocational Qualification) mode of the UK. Foreign vocational education examination mainly focuses on professional qualification and professional ability appraisal; the examination is mainly closely related to the student's future professional post demand of basic theoretical knowledge, skills, and abilities. Compared to theoretical examination, the assessment of practical ability accounts for a major part. This education examination focuses on skill and ability examination, which is in line with the essence of higher vocational education emphasizing the application and practice.

3.2. The Domestic Research Status

Domestic research on higher education quality monitoring and evaluation system at present is still in the exploratory stage, which has not yet set up a scientific, reasonable and easy-to-operate system (Xiao, 2013). Most of the evaluation attaches more importance to mode than content, to results than process, which did not highlight the comprehensive evaluation of students, thus, to a certain extent weakened the cultivation of student's innovation ability and technical training of professional ability (Chen, 2015). Hunan province has fully implemented multiple professional skill-testing standard since 2010, which reached the aim that promotes study through promoting the teaching purpose and improving relationship between teachers and students, whose experience is worth our reference (Chen, 2013).

4. Development Principles of "Skill Testing Standard of Marketing Curriculum"

4.1. The Scientific Nature

The law of vocational education and students' cognitive regularity should be followed when skill testing standard is developed. Selection method should be reasonable and should be in line with the practical teaching in vocational colleges (Zeng, 2012). The content of skill testing standard should highlight core skills assessment of professional curriculum.

4.2. The Development Nature

Skill testing standard should be proactive, which can reflect technological progress, economic and social development trend, reflect the development trend of professional and vocational education, set aside expanding space for the implementation of the skill testing standard (Li, 2013).

4.3. The Operation Nature

Skill testing standard should meet the basic conditions of learning practice of current vocational colleges in our province and improve implementation of professional courses.

4.4. The Normative Nature

Technical requirements and professional terms involved in the skill testing standard should conform to state standard or specification, to the requirements of the laws, regulations and relevant documents.

5. The Design of "Skill Testing Standard of Marketing Curriculum"

5.1. The Determination of Evaluation Module

The determination of evaluation module should be based on the following aspects: Research of companies related to graduates; talent training scheme, course

system and graduates survey results of marketing major from related colleges; national professional skill appraisal requirements.

5.2. The Score Proportion Design

Items of professional courses and professional skills will be sampled from professional morality and behavior as well as operation skill, total score is 100 points (Liu, 2011). It is suggested that scores about professional ethics and behavior account for 20%, scores about operating skill account for 80%. It is suggested that professional course skill sample scores are as follows: <60 points, unqualified; 60 - 85 points (including 60 points), qualified; more than 85 points (including 85 points), excellent.

5.3. Sample Test Paper Design

It is suggested that professional course skill sample test paper includes two parts: professional morality and behavior (Tang, 2014) as well as operation skill, whose ratio is 2:8.

1) Professional morality and behavior.

The main points of this part is students' compliance with laws and regulations, understanding of organization and management concepts, professional role consciousness, service consciousness, consciousness of security, saving consciousness, rigorous and meticulous professionalism and professional etiquette.

2) Operation skill.

The main points of this part is students' professional course knowledge and skill (Nie, 2015), which is divided into three parts: attention, task description and test requirement. The test requirement is divided into technical requirements, professional requirements, testing time requirements. Students will be measured according to the test material and provided professional situations to finish testing tasks.

5.4. Applied Major and Training Object

This standard is suitable for students majoring in Marketing from Department of Finance and Economics of Wuhan City Vocational College.

5.5. Skill Testing Purpose

Skill testing purposes are as follows: Test students' skills on investigation plan design and writing research report according to the given background; test students' skills on using business negotiation skills and strategy to improve business negotiation according to the business negotiation process (Hou, 2014); test students' skills on fully utilizing marketing strategy to plan and develop the new product promotion, public relations activities, advertising, sales promotion according to the background of the enterprise in accordance with the marketing planning process; test students' skills on using marketing and communication skills for product sales promotion according to the basic requirement for marketing practitioners and standard; test students' customer relationship man-

Table 1. Development of professional skill sample standard of marketing major.

Serial number	Development module	Items developed	Items mode	Assessment mode
1	Market survey skills sample	Design of survey scheme	Scheme design	Written test
		Design of survey questionnaire	Questionnaire design	Written test
		Design of market research report	Report design	Written test
2	Business negotiation skills sample	Business negotiation	Scenario simulation	Interview
		Organization of sales promotion	Scenario simulation	Interview
3	Marketing planning skills sample	CIS planning	Scheme planning	Written test
		Product planning	Scheme planning	Written test
		Promotion planning	Scheme planning	Written test
		Advertising planning	Scheme planning	Written test
4	Customer relationship management skills sample	Customer objection handling	Scenario simulation	Interview
		Customer relations maintenance	Scenario simulation	Interview

Note: According to the above-mentioned table, sample test will be combined with “written test and interview”.

agement skills (Liu, 2015); in the test, as the above-mentioned skills of students are tested, comprehensive evaluation of students’ professional quality in the process of actual operation should also be considered as shown in **Table 1**.

6. The Conclusion

As what has been said above, development of skill testing standard is helpful to guide the college to strengthen professional course construction, make teachers play the subjective initiative, enhance the classroom teaching quality and improve comprehensive quality of college students especially their practical skills. However, for the Hubei province, vocational skill testing system, as a kind of new vocational education teaching quality evaluation system, should be promoted gradually.

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The design and Application of Corporate Identity System Planning [grant No. CXY201633]; Youth innovative project of the 13th Five-Year Plan of CAET in 2016: Research on Creation and Practice of Maker Space Ecological System of Higher Vocational Colleges in Hubei Based on Maker Education [grant No.

G007].

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References

- Chen, X. (2015). Research on Skill Testing Practice of “Product Sales Promotion” of Marketing Major of Vocational Colleges. *Industry and Information Technology Education*, 2, 46-50.
- Chen, X. (2013). Research on Professional Ability Structure Model Related to Agricultural Trade of Higher Vocational—Take Brokerage and Agency of Agricultural Products Major as an Example. *Vocational & Technical Education Forum*, 3, 63-67.
- Hou, J. (2014). Exploration and Practice of Professional Core Courses’ Skill Testing of Higher Vocational Colleges. *Examination Weekly*, 79, 5-6.
- Liu, Y. (2015). Research on Professional Skill Testing System and Enterprise Skilled-Talent Ability Evaluation. *Scientific Chinese*, 3, 12-13.
- Li, X. (2013). Emphasis on Professional Skill Test to Cultivate High Skilled Talents. *The Road to Success*, 28, 29-32.
- Liu, X. (2011). Think of Establishing Teaching Quality Assessment System of Secondary Vocational Colleges. *Chinese Vocational and Technical Education*, 29, 42-45.
- Nie, H. (2015). Think of Skill Test and Professional Construction of Higher Vocational Colleges. *Read and Write Periodical*, 12, 44.
- Tang, D. (2014). Research on Team Construction of Teachers of Higher Vocational Based on Professional Skill Test. *Science and Technology*, 22, 28-30.
- Xiao, W. (2013). Research on Professional Courses Skill Test Evaluation Model in Higher Vocational Colleges. *Education Teaching Forum*, 12, 280-281.
- Zeng, Z. (2012). Research on Professional Skill Test and Professional Quality Cultivation of Higher Vocational Teachers. *Entrepreneur World*, 10, 15-18.
- Zhu, Y. (2015). Vocational Colleges in Hubei Skills Testing System Research. *Journal of Shangqiu Vocational and Technical College*, 1, 126-128.

Appendix

Questionnaire on Practical Skills Training Status of Students Majoring in Marketing of Wuhan City Vocational College

Dear students:

In order to better solve the problems of present professional practice skills training situation of students majoring in Marketing of Wuhan City Vocational College Hubei province, we make this questionnaire, hope to hear your valuable advice. The questionnaire is only for research, no other business purposes; we ensure that all information is not outflow.

Thanks to your support and help!

Department of Finance and Economics, Wuhan City Vocational College,

2016.09.08

1. Your gender? A. male B. female

Survey result: A. 65.33% B. 34.67%

2. What is your grade? A. 2016 B. 2015 C. 2014

Survey result: A. 43.25% B. 34.65% C. 22.10%

3. What is the mode for course-appraisal in your college?

A. exam in class B. closed-book exam C. Skill tests D. Papers or summary report
E. other

Survey result: A. 23.35% B. 60.50% C. 10.35% D. 5.8% E. 0

4. Do you think that the current evaluation system can better promote your learning effect?

A. I think it can best promote my learning effect

B. I think its effect is just so so.

C. I think it has no effect

D. I have another ideas.

Survey result: A.65.37% B.28.25% C.5% D.1.38%

5. What is your learning attitude towards practice skill at school?

A. Positive B. Negative C not care

Survey result: A. 73.25% B. 24.38% C.2.37%

6. What kind of test mode do you prefer when you finish your course?

A. Only theory test B. skill test C. theory test and skill test D. else

Survey result: A. 22.50% B.38.15% B.39.35%

7. Do you know skill test?

A. Know a lot B know a little C know little D else

Survey result: A.27.45% B.52.35% C.20.2%

8. What percentage of students joining in skill test do you suggest?

A. Less than 5% B. 5% - 25% C. 25% - 45% D. 45% - 65% E. else

Survey result: A. 12.25% B. 20.45% C.30.15% D.35.55% E.1.6%

9. What mode for skill testing do you suggest?

A. Written test B. computer test C. skill operation D. else

Survey result: A. 25.35% B.24.67% C.45.24% D.4.74%

10. What do you suggest for skill testing?

A. Professional knowledge test B. comprehensive knowledge test C. skill operation test D. else

Survey result: A. 20.56% B.28.57% C.38.35% D.12.52%

11. How long will you suggest for skill test?

A. An hour or less than an hour B. two hours C. three hours D. four hours E. more than four hours

Survey result: A. 26.86% B. 51.56% C.15.58% D5% E 1%

12. What is your suggestion for skill test in your college?



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Policies for Widening Participation and Success Factors in Portuguese Higher Education

Susana da Cruz Martins¹, Helena Carvalho², Patrícia Ávila², António Firmino da Costa²

¹Instituto Universitário de Lisboa (ISCTE-IUL), Centro de Investigação e Estudos de Sociologia (CIES-IUL), & Gulbenkian Professorship, Lisbon, Portugal

²Instituto Universitário de Lisboa (ISCTE-IUL), Centro de Investigação e Estudos de Sociologia (CIES-IUL), Lisbon, Portugal
Email: susana.martins@iscte.pt

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Abstract

Portugal's body of higher education students has progressively expanded, and opportunities for graduate certification at this level have multiplied. This paper advances factors that may provide a differentiated explanation of successful paths in higher education. It gives a first-hand account of the recent dynamics of participation in higher education in Portugal within the Bologna Process and uses institutional statistics to compare some of its most relevant characteristics with the European framework as a whole. Secondly, we used an extensive survey of Portuguese higher education students to identify factors potentially involved in successful paths and conducted a multiple logistic binary regression. The resulting model therefore included not only social and educational characteristics and backgrounds but also previous school trajectories, attendance of educational institutions and everyday practices. It identified key factors for success in academic careers by reference to a specific policy context and attendance of higher education. Our definition of these factors (dimensions of analysis) was based on the proposals of Tinto (2006; 1997) and Pinto (2002), using the variables available in that survey. Our results point to the relevance of institutional and educational dimensions as differentiated contexts of significance in different academic paths.

Keywords

Higher Education, Students and Graduates, Policies, Portugal, Success

1. Introduction

The aim of this article is to contribute to research into the multiplicity of explanatory factors that combine to produce different educational trajectories in academic success. Our analysis is framed by a context of enlargement and policies

designed to increase the number of students resulting from the implementation of the Bologna Process in Portugal. The main research question is identifying the most important explanatory factors of successful careers in higher education. While some of them have already been widely tested separately, here we feel it is particularly relevant to obtain a model in which these dimensions are part of an explanatory whole.

In this sense, the first part presents some of the recent dynamics involved in participation in Portuguese higher education, and additionally proposes a comparative European framework for some of the most important characteristics. This will be viewed with regard to the very important policy-making contexts that address the higher education system in national and European terms. The second part of this article discusses some of the theoretical and analytical contributions that problematise not only the trend towards an opening up of the system but also the persistence of inequalities in access to and success in higher education. At the end, though of central significance, we present the results of a model directed at explaining the many factors potentially involved in experiencing success in higher education in Portugal. This proposal allows us to operationalise some of the fundamental dimensions encountered in the theoretical models of, for example, [Vincent Tinto \(2006; 1997\)](#) and [José Madureira Pinto \(2002\)](#), who analyse successful educational careers. These contributions are crucial because they allow us to conduct a multidimensional analysis of academic success, considering not only social and educational characteristics at the outset, but also available indicators of these students' academic and social integration experiences.

We developed a model for interpreting success in higher education using logistic regression based on the hierarchy of the different analytical dimensions presented. These dimensions were socio-demographic characteristics (Block 1), social origins (Block 2), previous education (Block 3), training and education institutions in HE (Block 4) and daily life indicators (Block 5). Success in HE was measured on the basis of the students' answer as to whether they have ever failed a year in higher education. Though this indicator contains some conceptual and operational problems, it points to broad measurements, which in themselves provide interesting analytical advantages.

The primary empirical basis for our analysis is the data from a nationwide Survey of the Socio-economic Conditions of Higher Education Students that was carried out throughout the country in 2006 via Portugal's participation in Eurostudent Project III¹), and involved in particular the sub-sample of Portuguese students in the first cycle of higher education. The indicators used to define predictors of academic success were only included in the Portuguese questionnaire sent out in 2006 (within the Eurostudent Survey).

To complement this data, we use official statistical information from the Gen-

¹The EUROSTUDENT Project collects and provides comparable European data on the social dimension of European higher education. The main focus is on students' socio-economic backgrounds and living conditions and also on temporary international mobility. The project provides reliable, insightful cross-border comparisons.

eral Directorate of Statistics of Education and Science (DGEEC/MCE) and Eurostat. This will allow an initial up-to-date and comparative introductory framework for some of the characteristics of the higher education system.

2. Participation and Graduation in Higher Education: Scenarios and Dynamics

Since the end of the 1990s, the Bologna Process has been asserting itself from the perspective of a convergence of policies, institutional and course designs, and certification, with a view to the construction of a common European Area for Higher Education (Rauhvargers, Deane, & Pauwels, 2009). One of the main aims of this process was to enhance the competitiveness and autonomy of higher education institutions and broaden the social base of their students. Indeed, the social dimension was one of its most central aspects and major concerns (Bologna Process Working Group, 2007). This whole process results, in part, from guidelines for the widening (participative equity) and harmonisation of higher education and its institutional, social, and economic dimensions in Europe. “Educational success” also involves the performance of the various national systems and their capacity to respond to pressing qualification needs, that welcome different educational trajectories (continuous or interspersed) and life trajectories represented by men and women of various social origins and by both a young and an adult population (Martins, 2015). Though gradual, this opening up has been progressively more evident in the students’ access to, attendance at and certification by the Portuguese higher education system (cf. Martins et al., 2007; Mauritti & Martins, 2009).

The analysis that follows gives an up-to-date overview of participation in higher education from two perspectives. The first is diachronic and provides a general idea of the population at this level in Portugal (2.1). The second is a brief comparison with the European Union of the importance of certain processes and changes that have occurred in Portugal (2.2).

2.1. Recent Dynamics in Portugal

In recent years, higher education has been a focal point of interest, both as an object of study and an object of policy formulation within the framework of present-day societies and the strategic planning for their competitiveness.

At this point, we will also refer to the segments of the student population involved in an increase in access to higher education in Portugal. One of the guarantees of greater openness in the national higher education system concerns the (highly affirmative) presence of women. Their great disadvantage at this point is well known (in the older generations), but recent years have seen this contingent prevail in higher education (Martins et al., 2007; Martins, 2012, 2015). One could even say that in the last 15 years the difference between women and men enrolled in higher education has decreased.

The presence of different age segments also implies a certain progressive expansion in higher education. Though we are primarily dealing with a young

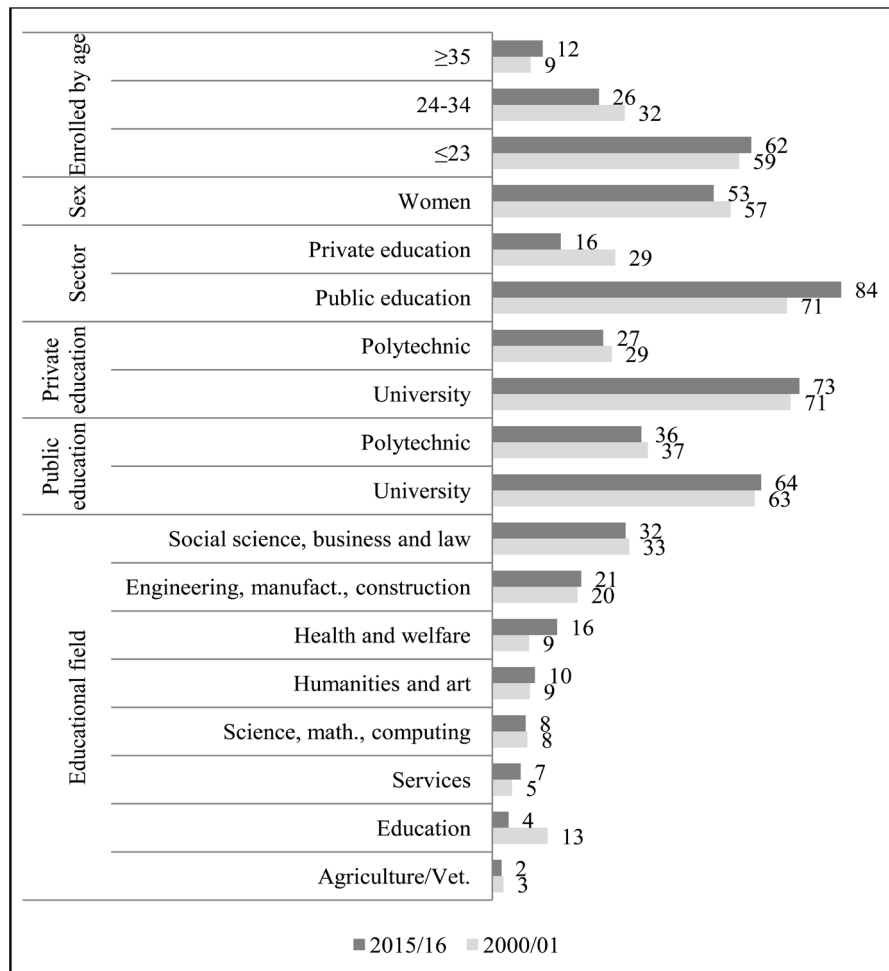
population—approximately 60% are less than 23 years older age groups are, however, gaining importance among the student body. In 15 years, there was a 3% increase in students over 35 years of age, an effect especially noted in recent years (cf. DGEEC/MCE). In fact, today we are witnessing institutional and political dynamics on a global scale in which lifelong learning and ever more highly qualified educational trajectories are promoted. Signs of the expansion and greater flexibility of higher education in Portugal can be seen in policy measures aimed at attracting new target segments. This may be happening for a number of reasons and some of them are relatively new in Portuguese higher education. For instance, some people are moving on to the next level of study. Others are returning after being forced to drop out due to family, education or work situations but are now able to resume their studies in a way more suited to their current life routines.

The implementation of the Bologna Process in Portugal (as of the mid-2000s) encouraged policies aimed at attracting non-traditional students (Martins, 2015). Examples are those that address access for people aged 23+ (Decree-Law No.64/2006) and the part-time student regulations (Decree-Law No.107/2008). These measures fit in with the guidelines on reforms in the Bologna Process. However, even if the process of convergence is taking place in Portugal (as is evident in comparison with other European countries), the fact remains that institutional diversity and organisational specificity are reflected in a higher education system that is fragmented and atomised throughout the country (Pinto, 2002), as we attempt to show below. If it is an impossible task to seek unanimity regarding, for example, the norms and forms of excellence (Perrenoud, 2003) on which educational success depends, then a higher education system with the above characteristics reinforces this difficulty even more.

Portugal was one of the first countries to set up a national qualifications framework that met the Bologna requirements (Rauhvargers, Deane, & Pauwels, 2009). The Bologna Process seems to have brought possibilities for more flexible, adaptable organizations and courses for different types of student. One of the most immediate effects seems to have been an increase in demand, particularly in state education.

The pairs “university and polytechnic education” and “public and private sector” spring to mind. When they are combined, four distinct types of institutions emerge. A reading of the data in **Figure 1** demonstrates the growing importance of the public sector in higher education participation in Portugal (84% of students). The weakening of private education in the last decade is well known. Private education has declined in relation to public education (a reduction of 13% of its attendees), the former currently representing 16% of students in Portuguese higher education. Students enrolled in polytechnics represent a third of those studying in higher education. This relationship between polytechnics and university proportions has remained stable in the last 15 years, but universities have gained some significance when compared to polytechnic education.

With regard to educational fields, the greatest share is assumed by those



Note: Students by age: 2014/15. Source: DGE/MCE, 2000/01-2015/16.

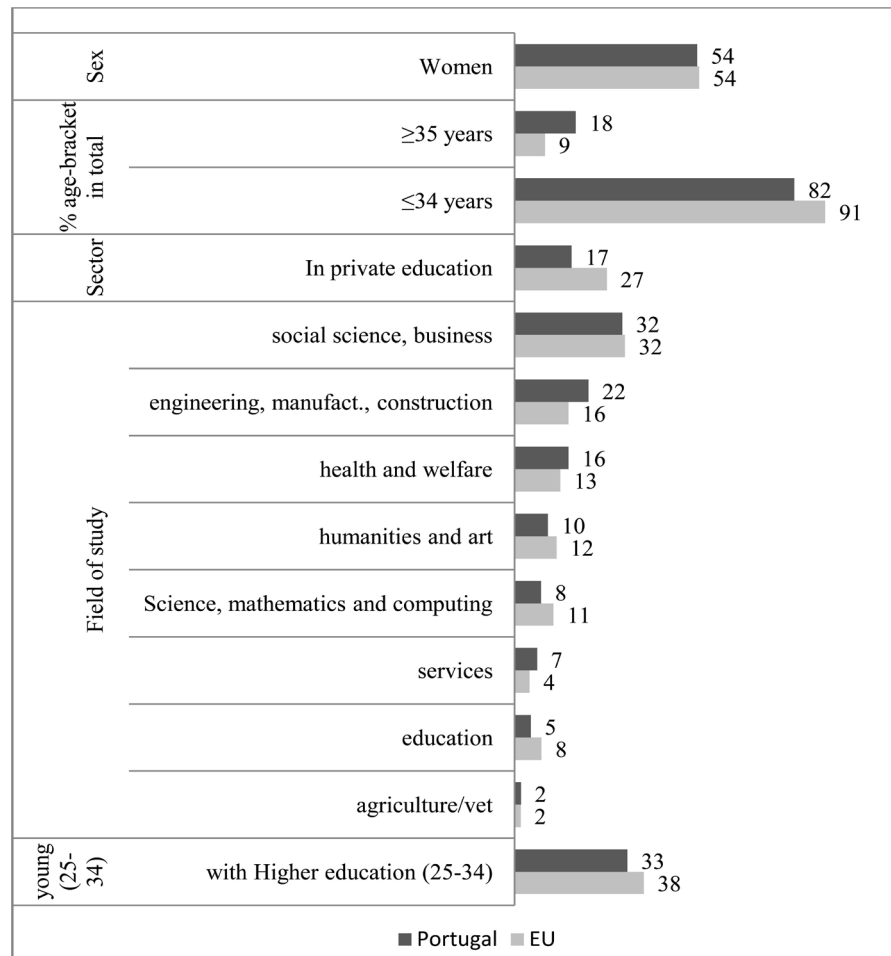
Figure 1. Participation in higher education (ISCED5-8), Portugal, 2000/01-2015/16 (%).

enrolled in social science; business and law; and in engineering, manufacturing and construction—fields with a broad range and that as a whole account for more than 50% of the students. Though this educational structure has remained stable in recent years, a pronounced decline has been noted in education and agriculture courses (sectors in which employment opportunities are also contracting), in contrast to a significant rise in the fields of health and welfare.

2.2. Comparative Perspective

In the preceding section, we presented a view of the Portuguese situation. Below, we identify some of the most striking features in the European context, along with the features that are most evident across the board.

One of these characteristics relates to the socio-demographic composition of those who attend higher education within the EU. In Europe, women are the ones with longer educational trajectories and higher qualifications. In fact, their histories in the system reflect greater “educational energy” (cf. Baudelot & Establet, 1992), an aspect that is emphasised in various studies that cross gender with educational trajectories.



Note: The differences in the percentage of attends by field of study (Figure 1 and Figure 2) are explained because the reference year is different: PT. Students by age: 2012; young with higher education (25 - 34): 2015. Source: Eurostat, 2014 (consulted online December 2016).

Figure 2. Students enrolled in and graduating from higher education (ISCED5-8), Portugal and EU, 2014 (%).

According to the data available for recent enrolments, Portuguese students are among the oldest in Europe. Nevertheless, the oldest age groups remain the least represented in higher education in the EU. According to available data on recent enrolments, Portuguese students are among the oldest in Europe. Even so, the oldest age groups remain the least represented in higher education in the EU. Although there is a European agenda that emphasizes the importance of lifelong learning, the fact is that older adults find it hard to return to education (Osborne, Rimmer, & Houston, 2015).

Despite the convergence achieved in higher education systems, diversity in institutions is also highly conspicuous in the EU (cf. Martins, 2012). This institutional diversity is seen across Europe. Private education, for example, assumes very different proportions between groups of countries (cf. Martins, 2012). The discrepancies certainly affect institutional and perhaps even pedagogical and course models in the various countries. In the EU as a whole, private education reaches almost 30%; in Portugal, this amount is lower (Altback & Levy, 2005).

With regard to the educational field, more than a third of the higher education students in the EU study in the fields of social science, business and law more than double the proportion of those in the second most popular fields (engineering, manufacturing and construction). However, the fields of social science bring together a very broad range of degrees, incorporating a large number of courses in almost all of the countries. On account of their specificity and the type of employability for which they are designed, agriculture and veterinary science, followed by services, are the least attractive fields for European students.

In the demographic perspective, we will give an analysis of the percentage of the population with a higher education in the age group in which, in most European countries, it is possible to have finished these studies (25 - 34 years of age). Almost 40% of the EU population in this age group are graduates. In Portugal, these percentages do not reach 35%, indicating some delay in advanced schooling processes (Martins, 2012).

3. Access to and Success in Higher Education: Theoretical Contributions

A common issue in research centred on higher education relates to the discrepancies in the access opportunities and the probabilities of success. In fact, though there has been a progressive opening up of higher education, social inequalities are still reflected in student recruitment and participation (Bohonnek et al., 2010; Mauritti & Martins, 2009; Orr, 2016; Scott, 2009; Shavit et al., 2007, to name just a few important publications). An analysis of a more structural type, such as proposed here, gives a great importance to variables related to social class and social backgrounds of students in higher education, either with respect to access or chances of success. This analytical dimension has been one of the main focuses of the sociology of education (at least since the consecrated work of J. Coleman and P. Bourdieu). Many authors discuss the importance of social class and cultural capital as comparative advantages that are reflected in different choices and possibilities for success in higher education (cf. Crozier, et al., 2008; Shavit et al., 2007; Werfhorst, Sullivan & Cheung, 2003).

From the viewpoint of what has usually been recognised as the relative restrictiveness of this level of education, today's higher education systems are generally more open. In various countries, including Portugal, a twin pattern of social recruitment is starting to appear (Machado et al., 2003; Martins, Mauritti, & Costa, 2005, 2007; Mauritti & Martins, 2009). In other words, though strong dynamics of reproduction are still visible, it is certain that at the same time, social mobility processes can be observed in higher education (especially in Portugal). There is an expansion in the segment of students whose origins involve lower levels of education, and less skilled and less well-paid socio-professional positions.

In addition to social class inequalities, however, others—particularly those linked to gender/sex and ethnic group—have had an influence on access, on processes of learning and relating to educational institutions and, certainly, on performance, which includes the risk of discontinuation. These inequalities vary,

marking the students' trajectories in very different ways, not only because of their diversity but also because of the various combinations that may result from them (Derouet, 2002; McNeal, 2011; Costa & Lopes 2011).

Regarding a dimension of socio-demographic analysis, the inequalities revealed, for example, in the different intake according to gender still have a certain analytical importance. Some of the analyses proposed by the classical texts, whether those of Pierre Bourdieu or Raymond Boudon, "neglected the marked—and sometimes paradoxical—differences that exist between the sexes" (Derouet, 2002: p. 11), differences that in the meantime various authors have tried to respond to from the point of view of their impact on educational careers (Baudelot & Establet, 1992; Deem, 1992; Duru-Bellat, Kieffer, & Marry, 2001; Marry, 2000; Richardson & Woodley, 2003). The differences between the sexes—significant despite everything—reflect a change in the demographics of the higher education population. In other words, we can see a transition from higher education systems that generally exclude women (evident in the academic qualifications of the older generations) to other educational systems that do not resist their entry on a broad scale (Martins, 2012). Another mark of openness in higher education relates to a greater age diversity of its students, giving expression to a greater presence of diversified academic and life trajectories.

The expansion of higher education, especially in developed countries, raises new research questions. A lot of the literature gives an account of social reproduction expressions in access to and success in higher education. At a time of expansion of higher education, these mechanisms do not disappear, but take on different contours that are reflected in other expressions of social hierarchies. The transformation of institutional and organizational models, now more flexible and open to different paths, and the introduction of policies on access by new segments of the population may be one of the most striking contributions made by the Bologna Process. This is particularly important in a country like Portugal, with a known educational deficit in relation to the rest of Europe.

Though authors such as José Madureira Pinto (2002) and Vincent Tinto (1975, 1997, 2005) attach special importance to certain characteristics that are exogenous and exist from the start with respect to attendance at higher education, they still consider other characteristics to be of significance. Pinto stresses the specificity and internal differentiation of the Portuguese higher education system (reflected in the difference between university and polytechnic, public and private systems, and fields of study). He extends his analysis to the organisational and pedagogical questions of teaching institutions, including the relations between the various actors in these situations, and in particular the sociability between fellow students and friends. Tinto gives particular importance to student integration into institutional situations and to the effect of institutions on higher education careers and results. By the nature of the data processed within the framework of this article, it was very difficult to gauge the quality and intensity of these integration processes. These proposals always take individual char-

acteristics into account with respect to social origins, personal attributes, and school careers prior to entry into higher education. These aspects will also be key dimensions in the work being presented in this article.

Though Tinto's research (Tinto, 1975, 2005) has marked many studies on the topic of higher education trajectories, in particular with regard to success, failure or discontinuation, other studies have revealed some of its limits (cf. Costa & Lopes, 2011, particularly regarding a study in Portugal on the success and failure of students in higher education). Some of these studies confirm the importance of the component of student experiences and conditions in higher education institutions (considering aspects such as academic preparation, financing of studies, employment and support for families, friendship networks and sociability); or underline the organisational and institutional factors in these students' social and economic integration (e.g., institutional expectations or obligations, academic services, staff attitudes, teaching/learning, and assessment), allowing us to demonstrate institutional habitus (Thomas, 2003); or academic trajectories of various types by reference to success and discontinuation (some more according to the trend, others against it, with inflections or an indication of difficulties with integration or the reconciliation of the various spheres of life) (cf. Costa & Lopes, 2011).

Certain recent studies report how, with the actual expansion of higher education public, some of the social inequalities registered have changed in extent and are more conspicuous in the ways that they combine with institutional differentiation in higher education—in particular, in the various forms of education and in relation to their social recognition and prestige—as seen in France (Lahire, 1997) but also in Germany (Schindler & Reimer, 2011), the UK (Brennan & Osborne, 2008) and Ireland (McCoy & Smyth, 2011), among other examples.

4. Methods and Data

4.1. Data-Gathering and Participants

The analysis carried out in this article is, essentially, the result of an extensive and quantitative methodology. The empirical information used to develop an interpretation model for success in higher education, relying on logistic regression, was based on part of the empirical data from the Survey of Socioeconomic Conditions of Higher Education Students carried out throughout the country among Portuguese higher education students in 2006. Although not too recent, the importance of such data remains. This is justified for three reasons: a) there are no other national representative and reliable surveys more recent on this student population, with the same type of indicators (socioeconomic characterisation, institutional, and educational paths and academic success); b) this block of questions (on success and educational paths) is a specificity of the Portuguese questionnaire and of this round; and c) this survey was conducted in the context of expansion of the system and production policies aimed at opening access, namely those related with the Bologna Process implementation in Portugal.

The sample was stratified by legal status, type of institution, region, field of

study and academic degree². Special emphasis was placed on the sub-sample of first cycle students (undergraduates)³.

4.2. Design and Data-Analysis

Of the indicators included for this purpose, we note those relating in particular to educational pathways and academic success.

Table 1 presents the dimensions (blocks of explanatory variables) that form an analysis model that allows success in the Portuguese higher education system to be predicted (binary dependent variable) by means of a logistic regression⁴. The indicators making up these blocks are Socio-demographic characteristics (Block 1), Social origins (Block 2), Previous education (Block 3), Training and education institutions in HE (Block 4), Daily life indicators (Block 5). These analytical dimensions were based on the theoretical models developed by **Vicent Tinto (1975, 1997)** and **Madureira Pinto (2002)** and the variables provided by the survey. These blocks and the hierarchical model were organized in accordance with these perspectives (especially **Tinto, 1975, 1997**). Individual, family (social background) and school attributes prior to entering higher education (**Tinto, 1975, 1997**), as shown in blocks 1, 2 and 3 respectively, were therefore considered first. Next, Block 4 covered the school system and its institutional and educational contexts, while Block 5 addressed what can be considered academic experiences and integration, which were measured only approximately on the basis of how students used their time. These last two blocks required greater adaptation of the **Tinto model (1975 and 1997)**.

The dependent variable reflects, in simplified form, the state of having achieved academic success in higher education. It relates to the indicator based on the question directed to the students about whether they had failed any year in higher education. Though this indicator is not free of conceptual and operational problems, it identifies some of the most influential factors in successful higher education trajectories.

One of the most sensitive questions in this work was, precisely, the operationalisation of the indicator of educational success. This success, an example par excellence of a notion with many meanings, consists of a whole range of approaches whose processing and measurement are a complex matter, in particular when the available empirical information is taken into account. **Philippe Perrenoud (2003)** draws attention to this difficulty and distinguishes two main levels of educational success: one level of educational success is associated with the performance of the students, when they respond to the norms of educational excellence and progress in their courses; the other level of educational success concerns the success of an institution, with the best institutions being those that achieve the objectives of a situation of relative competition or those of an educa-

²We used face-to-face interviews (on paper).

³For the sub-sample used, $n = 2,828$. Its key reference was the model questionnaire provided by the Eurostudent Project, though it also included additional questions. In 2006, the sample population included 367,312 students (2006)

⁴The multicollinearity was also checked and all the tolerance values are up to 0.01 (**Hair et al, 2010**).

Table 1. Success in higher education: the application of logistic regression.

Dimensions of analysis (Blocks of variables)	Independent variables
Socio-demographic characterization (Block 1)	Sex: Male Female Age
Social origins (Block 2)	Socio-occupational categories (social classes) entrepreneurs and executives professionals and managers self-employed routine employees industrial workers multi-active employees Years of schooling of father Years of schooling of mother
Previous education (Block 3)	Earlier failure (year repeated): Yes No Route of access to higher education general course technological course vocational course “second-chance” education Other
Characterization of training and educational institutions in HE (Block 4)	Sector in secondary education: Public Private (or cooperative) Sector of educational institution: Public Private (or cooperative) Education subsystem: University Polytechnic Field of study Education humanities and art social science, business and law science, mathematics, computing engineering, manufacturing, construction agriculture and Veterinary health and welfare Services
Daily life indicators (Block 5)	Average number of hours per week in class activities Average number of hours per week studying Average number of hours per week working

tional system taken as a whole. Even so, the two levels of success mentioned are clearly related. After this, we focus more closely on the first level, with particular attention being given to the performance of higher education students within the framework of the Survey of the Socio-Economic Conditions of Higher Education

Students.

The indicators for higher education students' success or failure, which were included when the survey was carried out in 2006, relate to the students' own declarations of the presence or absence of failure in their whole educational career, with a distinction being made between the various education cycles. In the analysis, precedence is given to the occurrence of these indicators in higher education.

From our reading of the results for educational success and failure in the first (undergraduate) cycle of higher education, we can state that under the conceptual and operational conditions at our disposal, 78.2% of the respondents declared that they had never failed at this level, which constitutes a situation of educational success (**Table 2**). It is important to mention that at the time of the survey, the students had not yet finished their courses and so could still fail at that stage of their academic career. Accordingly, that percentage could certainly be underestimated. Even so, the percentage represents the first measurement of the object in question.

The interpretation of these percentages involves certain indefiniteness. Not only are the students' own perceptions of the concept of "educational failure" taken into account, but the concept is also marked by a myriad of evaluations that punctuate and reorient the educational trajectory. In addition, there is no broad and established consensus regarding what exactly is being referred to (an aspect stressed by [Perrenoud, 2003](#)). Furthermore, the concept of educational success has various gradations and is a nuanced concept, par excellence, at various levels. These gradations are not recognised here given the difficulty in obtaining highly specific information on the classification dimensions of this success.

Other formulations have been based on the prolongation of higher education studies (measured in years of delay), commonly registered in the statistics as educational failure. However, these "delays" may often be the result of changes of direction in education (transfers between courses or institutions) or the students' participation in the labour market, which may complicate the pursuit of their studies within the time limit prescribed by their formal study plans, though they do not necessarily indicate negative results (cf. [CHEPS and NIFU, 2015](#)).

As stated, the formulation accepted for this research may not be problem-free. However, when combined with different variables and taken as a starting point for highly valuable multivariate analyses to ascertain the complexity and

Table 2. Indicator of educational success among students in the first higher education cycle (%).

Higher education	%
No years failed	78.2
With failure	21.8
Total (n=2824)	100.0

Source: CIES-IUL, 2006.

multi-dimensionality involved in comprehending success in higher education trajectories, this formulation may reveal important trends and the meanings of analytical relationships.

5. Success in Higher Education: An Interpretative Model

To assess the relative importance of a set of dimensions in explaining success in higher education, a model was defined and tested using Binary Logistic Regression. A hierarchical regression was used because the model includes different blocks of explanatory dimensions: a) socio-demographic indicators (individual attributes), b) indicators characterising social origins, c) indicators relating to earlier educational careers, d) indicators characterising schooling and educational institutions, and e) indicators characterising daily life.

The first block of predictive variables (Block 1) concerns *demographic characteristics*, which include sex and age. One of the striking results of this first model is that both age and sex are significantly related to success in tertiary education ($\chi^2(2) = 152.830, p < 0.001$). These effects demonstrate that the possibility of success in higher education is higher among girls and younger students. Thus, the model presented here, still viewed from a partial perspective, immediately reveals a demographic pattern associated with successful higher education students.

When the second block is added, this time relating to *social origins* (Table 3), the relationships noted above with demographic variables are maintained. However, this new block, which includes social class and parental years of schooling, does not significantly affect the explanation of the success ($\chi^2(7) = 7.516, p > 0.05$). That is, the social inequalities at the starting point, still highly evident in access to Portuguese higher education (Martins et al., 2007; Mauritti & Martins, 2009), do not have a significant effect on the possibility of being successful for those who have already entered higher education. As is already known, this may be a subsidiary effect of highly selected trajectories in earlier educational stages (and, therefore, those who reach this level have sufficient merit for the social conditions at the starting point to interfere less) (cf. Breen & Jonsson, 2005; Schlicht et al., 2010), or it may be because the dependent variable used here does not allow us to capture different gradations of success in an analysis of the main contingent of the first (undergraduate) cycle of higher education. Another observation that may also explain the weakening of the variable on social origins in this model involves the importance of the contexts and types of institution and education, which are always marked by social mechanisms and hierarchies—for the Portuguese situation, cf. Martins et al. (2007); for other European cases, see also Boliver (2011), Brennan & Osborne (2008), Shindler & Reimer (2011). Additionally, the visibility of these effects may have been transferred to the subsequent higher education levels, not only with regard to access but also the probability of success.

The third block covers *educational careers* prior to admission to higher education and has a significant effect ($\chi^2(6) = 17.298, p < 0.01$). It is important to

note here that the students who followed technological courses at the secondary level have a lower probability of success at the higher education level (*odds ratio* = 0.687, $p < 0.05$) compared to general course students. For many secondary school careers, a technical and occupational education may have already been a response to combat the failure that had occurred there. The weight of the type of school trajectories first determines access, visible in most European countries (Griga & Orr, 2010), but also leaves some marks on success in higher education, as seen in this study in relation to the Portuguese reality.

Table 3. (a) Success in higher education: Determining factors (Hierarchical Binary Logistic Regression); (b) success in higher education: determining factors (*cont.*).

		(a)				
		Success in HE				
Independent variables		<i>Odds ratio</i>	<i>Odds ratio</i>	<i>Odds ratio</i>	<i>Odds ratio</i>	<i>Odds ratio</i>
Block 1: Socio-demographic characterization	Male (sex)	0.494***	0.488***	0.505***	0.813	0.813
	Age	0.912***	0.911***	0.905***	0.910***	0.910***
	Model: $\chi^2 (2) =$	152.830***				
	$R^2_N =$	0.087				
Block 2: Social origins	Socio-occupational categories (social classes) (<i>reference category</i> : Professional and Managers)					
	entrepreneurs and executives		1.069	1.096	1.209	1.165
	self-employed		0.867	0.881	0.991	0.987
	routine employees		1.267	1.287	1.279	1.205
	industrial workers		0.947	0.977	1.159	1.147
	multi-active employees		0.961	0.981	1.180	1.162
	Years of schooling of father		1.027	1.026	1.023	1.022
	Years of schooling of mother		0.974	0.975	0.974	0.974
	Block: $\chi^2 (7) =$		7.516			
	Model: $\chi^2 (9) =$		160.346***			
Block 3: Previous education	$R^2_N =$		0.091			
	Earlier failure (year repeated)			0.859	0.950	0.927
	Route of access to higher education (<i>reference category</i> : general course)					
	technological course			0.687*	0.937	0.910
	vocational course			1.492	2.108*	2.244*
	<i>second-chance</i> education			1.496	1.367	1.398
	other			1.913	1.974*	2.087*
	Institutional sector in secondary education: private (or cooperative) (<i>reference category</i> : public)			0.854	0.683**	0.665**
	Block: $\chi^2 (6) =$		17.298**			
	Model: $\chi^2 (15) =$		177.644***			
	$R^2_N =$		0.100			

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

(b)						
Independent variables		Success in HE				
		<i>Odds ratio</i>	<i>Odds ratio</i>	<i>Odds ratio</i>	<i>Odds ratio</i>	<i>Odds ratio</i>
Block 4: Training and educational institutions	Sector of educational institution: private (or cooperative) (<i>reference category</i> : public)				1.465**	1.579**
	Education subsystem: polytechnic (<i>reference category</i> : university)				0.436***	0.400***
	Field of study (<i>reference category</i> : social science, business and law)					
	Education				3.914***	3.981***
	Humanities and Art				2.274***	2.304***
	Science, Mathematics, Computing				0.785	0.763
	Engineering, Manufacturing, Construction				0.552***	0.521***
	Agriculture and Veterinary				0.638	0.567
	Health and Welfare				4.182***	3.566***
	Services				1.803*	1.767*
	Block: χ^2 (9) =				214.857***	
	Model: χ^2 (24) =				392.501***	
	R^2_N =				0.213	
Block 5: Daily life indicators	Average number of hours per week in class activities					1.035***
	Average number of hours per week studying					0.991
	Average number of hours per week working					1.003
	Block: χ^2 (3) =					28.062***
	Model: χ^2 (27) =					420.563***
	R^2_N =					0.227

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The indicators *characterising education and educational institutions* (Block 4) are undoubtedly those that have the greatest effect in explaining higher education success ($\chi^2(3) = 214.857$, $p < 0.001$). In relation to the subsystems, studying at a polytechnic reveals a greater probability of failure at this level (*odds ratio* = 0.436, $p < 0.001$), whereas following university studies increases the possibility of success as operationalised here.

The fields of study provide an additional perspective to the research problem in question. In fact, detailed analysis of the importance of this variable, as a factor of success or failure in higher education, allows us to note four situations when the different study fields are compared with the category of reference, Social Science, Business and Law:

- The first relates to Health and Welfare students, who generally experience less educational failure (*odds ratio* = 4.182, $p < 0.001$). Moreover, as various studies have indicated, those enrolled in this field are more likely to be female

- and also reflect strong social reproduction (at the socio-professional and qualification levels) (Bourdieu & Passeron, 1970). On this subject, see the case of Portuguese students in health courses, e.g., Machado et al. (2003);
- b) Education students have the highest levels of failure in their schooling prior to admission to higher education (according to their own questionnaire responses), though, at this level, they follow those mentioned above in presenting the progressions most *protected* from course repetition (*odds ratio* = 3.914, $p < 0.001$). This segment, which is also more likely to be female, though its social recruitment is the broadest, has managed somewhat to turn earlier school careers with achievement problems into successful ones in higher education;
 - c) Students in Humanities and Art and Services also tend to be more successful in higher education (respectively, *odds ratio* = 2.274, $p < 0.001$ and *odds ratio* = 1.803, $p < 0.05$) when compared to Social Science, Business and Law students;
 - d) Engineering students, mainly male, invert the educational performance trend among those above. Although the rates of success in primary and secondary schooling are close to those of the whole higher education population, at this level they present the lowest probability of success (*odds ratio* = 0.552, $p < 0.001$) and the highest possibility of repetition, compared to students from the fields of Social Science, Business and Law.

In this comparison, the distances between the engineering and education students' records reveal not only different assessment cultures and instruments (with, to a greater or lesser extent, *facilitating* appropriations) but also different educational and pedagogical attitudes and objectives (in the learning framework and vocational motivation), as well as varying types of reception by the institutions (when we also take the differences between educational sectors and sub-sectors into account).

The educational sector also has a significant effect (*odds ratio* = 1.465, $p < 0.01$); it can be seen that in comparison to their counterparts in the public network, private and cooperative education students have a higher probability of completing their education without failure, with such episodes figuring to a lesser degree in their academic careers.

It is also important to add that the introduction of Block 4—a set of variables describing the factors related to integration into and the experience of education, in addition to specificities of the educational system—gains importance with regard to the possibility of repetition in higher education (a variable included in Block 3). This model strengthens the perspective that for those who studied in that sector, the possibility of failure in higher education tends to rise (*odds ratio* = 0.665, $p < 0.01$), i.e., it does not represent an advantage in the educational careers of the student population enrolled.

To complete the model explaining success in higher education, a final block is inserted, relating to the students' *daily lives* or, more exactly, the average time spent in contact hours, study and work. Though the weight of this last block is

not very great, it still has a significant effect ($\chi^2(3) = 28.062$, $p < 0.001$). With regard to the contribution of the indicators, a salient feature is that the students who spend most hours, on average, in contact activities form the segment with the highest likelihood of success (*odds ratio* = 1.035, $p < 0.001$).

To sum up, the variables with the most influence on situations of higher education success are—according to their effect size—characteristics of the educational institution, type of education, field of education, age (reflecting individual life cycles), organisation of the daily periods more or less dedicated to contact activities, and schooling conditions at the starting point, in particular access routes and state-sector secondary studies.

6. Discussion and Conclusion

This model, oriented towards the successful paths of students, combines very profitably with the recognition of the higher education system (students enrolled and graduates) and its main policy orientations. These two approaches are not only reconcilable but also highly productive in the reciprocal gains of greater analytical force. This triangulation provides us with a better knowledge of the processes and results involved in some of the political, institutional and social changes in higher education.

The perspective of Portuguese higher education adopted here can also be useful in analyses in countries where its expansion is also recent. Policies in Portugal have focused mainly on social enlargement and increased participation and less on success and national regulation (CHEPS and NIFU, 2015). These circumstances can be seen in a number of other countries, especially in Eastern Europe. The analytical model presented here is designed as a basis for reflection on success in higher education not only in Portugal, but also in countries with similar participation and graduation dynamics and the same kind of political orientations.

Higher education has undoubtedly been the object of political intervention, though its effects—in particular in the social and demographic structure and in the type of institutional relationship that they establish with the educational organisations in which they study or have studied—seem to be moderate and fairly slow. However, some of the most important dynamics at the European level are also recognised in the Portuguese system. In this regard, through a reading of the statistical data presented in the first part of this article, which covers about a decade and a half, we can observe certain stability. However, we can also recognise the effect of policies on some transformations of the profile of these students in the demographic characterisation, as well as in the institutional and educational analysis. This provides a number of assurances with regard to how far the use of the data from the Socio-economic Survey of Higher Education Students is up to date and relevant. The logistic regression model undertaken, using these data as its base, underlines precisely the institutional and educational dimensions as differentiated contexts with significance in distinct academic results. However, we would make a last note regarding the conception of academic

success used, which principally expresses the main trends in educational trajectories, without offering the possibility of a detailed reading of various levels and echelons of academic success. The effect is stronger when it is known that the various educational institutions and fields develop their own methods of recruiting and assessing their students, with evident differences in their criteria, values and outlook. If the pressure of the Bologna Process in the harmonisation and standardisation of student assessment processes is taken into account, such a task seems too difficult (Sin & Manatos, 2013), given not only the institutional diversity but also the greater diversity among students. In addition to this complexity, these institutional and educational contexts are not immune to social mechanisms and hierarchies that certainly influence access (as confirmed by earlier studies already mentioned) as well as the performance of their students. In this way, although this model is beneficial on account of the type of results it achieves and the interpretations it makes possible, it still raises many questions and uncertainties—in brief, it still raises questions about new problems that, if tested more thoroughly, could give rise to further research. However, after considering a set of policies aimed at opening up higher education, this model offers insight regarding the formulation of policies that promote paths of academic success.

In reality, Portugal currently faces new circumstances with regard to higher education. After a clear cycle of opening up, the Portuguese education system met some setbacks in recent years, particularly concerning the number of students enrolled in higher education (Rodrigues & Heitor, 2015). It is a moment to ponder the policies that contribute to access and success in higher education. This preoccupation with success and completion in higher education was also intensified in the guidelines and modes of governance at a European level (CHEPS and NIFU, 2015). There are some points that warrant more research and dialogue with policy makers and to which our research has only provided some clues.

Recognising modes of access to higher education by identifying the nature of the main obstacles to sustainability among those entering higher education.

- Interpreting how different previous paths of education guided access and success in higher education.
- Concerning this, some questions can be asked. How have different study areas hosted and designed different paths of success?
- How can different institutions, positioned in different subsystems of the education provisioning network, accommodate increasingly diversified students while implementing equivalent modes of promotion and recognition of success?
- Despite the fact that differences in social origins seem to weigh more on access than on success in higher education, how are social and economic dimensions present in higher education and how do they influence the guidelines and decisions made by students when undertaking their courses?
- Is it possible that from the impacts of a period of relative productivity of po-

litical measures that were largely framed by the implementation of the Bologna Process and mainly focused on access and flexibility of attendance, a new generation of policies taking into account the promotion of success with a public that is increasingly diversified can be designed?

These exploratory questions may be good pointers for further research and policy questions about new directions for higher education in Portugal, taking account of the requirements of the European Area for Higher Education.

References

- Altbach, P., & Levy, D. (2005). *Private Higher Education: Global Revolution*. Rotterdam: Sense Publishers.
- Baudelot, C., & Establet, R. (1992). *Allez les filles!* Paris: Maspéro.
- Bohonnek, A., Camilleri, A. F., Griga, D., Mühleck, K., Miklavič, K., & Orr, D. (2010). *Evolving Diversity: An Overview of Equitable Access to Higher Education in Europe* (136 p). Brussels: The EQUNET Consortium, European Commission.
- Boliver, V. (2011). Expansion, Differentiation, and the Persistence of Social Class Inequalities in British Higher Education. *Higher Education*, 61, 229-242.
<https://doi.org/10.1007/s10734-010-9374-y>
- Bologna Process Working Group (2007). *Key Issues for the European Higher Education Area—Social Dimension and Mobility*.
<http://www.regeringen.se/49b72f/contentassets/f7fbd3c20af0477495cb35c87768fd82/ke-y-issues-for-the-european-higher-education-area---social-dimension-and-mobility>
- Bourdieu, P., & Passeron, J. (1970). *La reproduction: Elements pour une theorie du systeme d'enseignement*. Paris: Minuit.
- Breen, R., & Jonsson, J. O. (2005). Inequality of Opportunity in Comparative Perspective: Recent Research on Educational Attainment and Social Mobility. *Annual Review of Sociology*, 31, 223-243. <https://doi.org/10.1146/annurev.soc.31.041304.122232>
- Brennan, J., & Osborne, M. (2008). Higher Education's Many Diversities: of Students, Institutions and Experiences, and Outcomes? *Research Papers in Education*, 23, 179-190.
<https://doi.org/10.1080/02671520802048711>
- CHEPS and NIFU (2015). *Dropout and Completion in Higher Education in Europe*. Main Report, Luxembourg: Publications Office of the European Union.
- Costa, A. F., & Lopes, J. T. (2011). The Diverse Pathways of Higher Education Students: A Sociological Analysis on Inequality, Context and Agency. *Portuguese Journal of Social Science*, 10, 43-58. https://doi.org/10.1386/pjss.10.1.43_1
- Crozier, G., Reay, D., Clayton, J., Colliander, L., & Grinstead, J. (2008). Different Strokes for Different Folks: Diverse Students in Diverse Institutions-Experiences of Higher Education. *Research Papers in Education*, 23, 167-177.
<https://doi.org/10.1080/02671520802048703>
- Deem, R. (1992). Schooling and Gender: The Cycle of Discrimination. In J. Lynch, C. Modgil, & S. Modgil, (Orgs.), *Cultural Diversity on the Schools, Vol. 3: Equity or Excellence? Education and Cultural Reproduction* (pp. 81-97). London: The Falmer Press.
- Derouet, J.-L. (2002). A sociologia das desigualdades em educação posta à prova pela segunda explosão escolar: Deslocamento dos questionamentos e reinício da crítica. *Revista Brasileira de Educação*, 2, 5-16.
<https://doi.org/10.1590/S1413-24782002000300002>
- Duru-Bellat, M., Kieffer, A., & Marry, C. (2001). La dynamique des scholarités des filles: le double handicap questionné. *Revue Française de Sociologie*, 42, 251-281.

<https://doi.org/10.2307/3322966>

- Griga, D., & Orr, D. (2010). Chapter 4: Entry into Higher Education. In A. Bohonnek, A. F. Camilleri, D. Griga, K. Mühleck, K. Miklavič, & D. Orr (Eds.), *Evolving Diversity: An Overview of Equitable Access to HE in Europe* (pp. 29-43). Brussels: The EQUINET Consortium, European Commission.
- Hair, J., Black, W., Babin, B., & Anderson, R. (2010). Cluster Analysis. In: J. Hair, W. Black, & B. Babin (Eds.), *Multivariate Data Analysis: A Global Perspective* (7th ed., pp. 477-536), New York: Pearson Prentice Hall.
- Lahire, B. (1997). *Les manières d'étudier*. Paris: OVE.
- Machado, F. L., Costa, A. F., Mauritti, R., Martins, S. C., Casanova, J. L. and Almeida, J. F. (2003). Classes sociais e estudantes universitários. *Revista Crítica de Ciências Sociais*, 66, 45-80. <https://doi.org/10.4000/rccs.1140>
- Marry, C. (2000). Filles et garçons à l'école. In A. V. Zanten (Ed.), *L'École l'état des savoirs* (pp. 283-292). Paris: Éditions la Découverte.
- Martins, S. C. (2012). *Escolas e estudantes da Europa: Estruturas, recursos e políticas de educação*. Lisbon: Editora Mundos Sociais.
- Martins, S. C. (2015). A abertura do ensino superior à diversidade de públicos: Políticas e orientações. In M. L. Rodrigues, & M. Heitor (Eds.), *40 Anos de políticas de ciência e de ensino superior* (pp. 735-756). Lisbon: Almedina.
- Martins, S. C., Mauritti, R., & Costa, A. F. (2005). *Social and Economic Conditions of Students in Portugal*. Lisbon: DGES/MCTES.
- Martins, S. C., Mauritti, R., & Costa, A. F. (2007). *Higher Education Students: Survey of Socio-Economic Conditions, 2007*. Lisbon: DGES/MCTES.
- Mauritti, R., & Martins, S. C. (2009). Higher Education Students: Contexts and Social Origins. In A. F. Costa, F. L. Machado, & P. Ávila (Eds.), *Knowledge and Society, Vol. 2: Portugal in the European Context* (pp. 81-97). Lisbon: Celta Editora.
- McCoy, S., & Smyth, E. (2011). Higher Education Expansion and Differentiation in the Republic of Ireland. *Higher Education*, 61, 243-260. <https://doi.org/10.1007/s10734-010-9375-x>
- McNeal Jr., R. (2011). Labour Market Effects on Dropping out of High School: Variation by Gender, Race, and Employment Status. *Youth Society*, 43, 305-332. <https://doi.org/10.1177/0044118X10363776>
- Orr, D. (2016). *Monitoring Cross-Country Performance in Equality of Access and Affordability of Tertiary Education—A Review of Options*. UNESCO, Global Education Monitoring Report.
- Osborne, M., Rimmer, R., & Houston, M. (2015). Adult Access to Higher Education: An International Overview. In J. Yang, C. Schneller, & S. Roche (Eds.), *The Role of Higher Education in Promoting Lifelong Learning* (pp. 17-39). Hamburg: UNESCO Institute for Lifelong Learning.
- Perrenoud, P. (2003). Sucesso na escola: Só o currículo, nada mais que o currículo! *Cadernos de Pesquisa*, 119, 7-26. <https://doi.org/10.1590/s0100-15742003000200001>
- Pinto, J. M. (2002). Factores de sucesso/insucesso. In CNE (Org.), *Sucesso e Insucesso Escolar no Ensino Superior Português* (pp. 121-141). Lisbon: CNE.
- Rauhvargers, A., Deane, C., & Pauwels, W. (2009). *Bologna Process Stocktaking Report 2009*. http://media.ehea.info/file/2009_Leuven_Louvain-la-Neuve/94/7/Stocktaking_report_2009_FINAL_594947.pdf
- Richardson, J., & Woodley, A. (2003). Another Look at the Role of Age, Gender and Subject as Predictors of Academic Attainment in Higher Education. *Studies in Higher*

- Education*, 28, 475-493. <https://doi.org/10.1080/0307507032000122305>
- Rodrigues, M. L., Heitor, M. et al. (2015). *40 Anos de políticas de ciência e de ensino superior*. Lisbon: Almedina.
- Schindler, S., & Reimer, D. (2011). Differentiation and Social Selectivity in German Higher Education. *Higher Education*, 61, 261-275.
<https://doi.org/10.1007/s10734-010-9376-9>
- Schlicht, R., Stadelmann-Steffen, I., & Freitag, M. (2010). Educational Inequality in the EU: The Effectiveness of the National Education Policy. *European Union Politics*, 11, 29-59. <https://doi.org/10.1177/1465116509346387>
- Scott, P. (2009). *Access in Higher Education in Europe and North America: Trends and Developments*.
- Shavit, Y., Arum, R., & Gamoran, A. (2007). *Stratification in Higher Education: A Comparative Study*. Stanford, CA: Stanford University Press.
- Sin, C., & Manatos, M. (2013). Student Assessment in Portugal: Academic Practice and Bologna. *Policy Higher Education Policy*, 27, 323-340.
<https://doi.org/10.1057/hep.2013.27>
- Thomas, L. (2002). Student Retention in Higher Education: The Role of Institutional Habitus. *Journal of Educational Policy*, 17, 423-442.
<https://doi.org/10.1080/02680930210140257>
- Tinto, V. (1975). Dropout from Higher Education: A Theoretical Synthesis of Recent Research. *Review of Educational Research*, 45, 89-125.
<http://www.jstor.org/stable/1170024>
<https://doi.org/10.3102/00346543045001089>
- Tinto, V. (1997). Classrooms as Communities: Exploring the Educational Character of Student Persistence. *The Journal of Higher Education*, 68, 599-623.
<https://doi.org/10.2307/2959965>
- Tinto, V. (2006). Enhancing Student Persistence: Lessons Learned in the United States. *Análise Psicológica*, 1, 7-13.
- Van De Werfhorst, H., Sullivan, A., & Cheung, S. (2003). Social Class, Ability and Choice of Subject in Secondary and Tertiary Education in Britain. *British Educational Research Journal*, 29, 41-62. <http://www.jstor.org/stable/1501538>
<https://doi.org/10.1080/0141192032000057366>

Digital Platform e-Códex: A Hybrid Virtual Space

Márcia Izabel Fugisawa Souza, Tércia Zavaglia Torres, José Ruy Porto de Carvalho,
João dos Santos Vila da Silva, Silvio Roberto Medeiros Evangelista,
Daniel Rodrigo de Freitas Apolinário

Embrapa Agricultural Informatics, Campinas, Brazil

Email: marcia.fugisawa@embrapa.br, tercia.torres@embrapa.br, jose.ruy@embrapa.br, joao.vila@embrapa.br,
silvio.evangelista@embrapa.br, daniel.apolinario@embrapa.br

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Abstract

Mobile learning is the kind of learning that applies mainly to non-formal education actions from the perspective of continuing education. Within the scope of companies, the demand for educational actions is increasing, notably focused on distance education and training, aimed at both internal and external audiences. However, for the implementation of activities dedicated to mobile learning, it is necessary to develop a digital platform to host the virtual learning environment. Under these conditions, it should be structured in a flexible format and design to encourage interactivity between learners and teachers in the implementation of teaching and learning activities. The article presents and discusses a proposal for a digital mobile platform, called e-Códex, which aims to support educational actions, to promote collaboration and learning, as well as to meet the information dissemination and knowledge generation needs of the Brazilian agroforestry sector. The research was carried out in two phases, the first one consisted of a review of the theoretical-conceptual literature on topics involving cyberspace, digital media and education in virtual spaces, in order to subsidize the development of a digital platform for support the educational actions within the scope of the Embrapa Special Forest Code Project. The second phase of the research consisted in the application of questionnaires to the members of the Special Forest Code Project to know their perceptions and interaction requirements, considered relevant in a digital virtual space, in order to favor horizontal and dialogic relations conducive to new learning. The analysis of the data pointed to the definition of essential elements of the platform design, associating with this, a set of functionalities capable of favoring aspects of interactivity, integration, sharing and exchange of information, knowledge and experiences inherent to virtual learning spaces. The e-Códex Platform incorporates aspects considered important by the research subjects, such as: the need for its creation, their main characteristics and contributions, the possibilities of use, and the forms

of organization of the contents and activities offered.

Keywords

Digital Platform, Multimodal Learning, Cyberspace, Virtual Space, Digital Space, Mobile Applications

1. Introduction

The increasing incorporation of digital technologies in education, in particular, the non-formal education is associated to the formation and expansion of a new type of learning, the learning mobility, also called mobile learning. For that mobile learning activities occur it is required a digital platform mobile, whose main function is to house an educational environment in the virtual space. This environment is a locus of multi-interactions, as a rule, practiced among learners, teachers and other actors, which are provided with mobile devices (such as mobile phones and tablets) may, at any time and place, share teaching resources and media, information, knowledge, experience etc.

A platform to host a virtual space must be structured in format and design flexible to encourage, especially the aspects of interactivity and interaction involved in implementing activities of teaching and learning. In this way, the construction of a digital platform should be guided by an innovative methodology and a set of technologies capable of favoring the interactivity, the integration, the sharing and exchange of knowledge, and information between the actors involved. Communicational aspects arising from the use of digital technologies should also be considered, since it can provide elements to guide the design of a platform that will meet the needs imposed by the emergence of a new modality of communication, which is set by the interactivity, horizontality, and communicative bidirectionality.

Digital technologies are taken as instruments that facilitate the interactions between people, which coexist in social networks, in an interactive, horizontal and collaborative way. For this reason, they are potentially facilitator of the creation and expansion of opportunities for participation and intervention which arose in the communicational process. Considered as communicational media, these technologies are also highlighted for being carriers of different languages and meanings, revealing a sociocultural character, typical of events such as occur in interpersonal interactions.

Those issues marked the preparation of a proposal for creating a digital mobile platform for housing virtual space that mirror the needs of the target audience for information and knowledge of the implementation of the new Brazilian Forest Code¹ (Brasil, 2012). That is an important legal framework newly imposed by

¹Refers to Law no. 12.651, May 25th 2012, which provides for the protection of native vegetation and “[...] establishes the general rules about where and how the Brazilian territory can be exploited at determining the areas of native vegetation that should be preserved and which regions are legally entitled to receive the different types of rural production”. (Portal Brasil, 2012: p. 1).

the Government of Brazil, which aims at the protection of native vegetation, in the environmental and forestry dimensions, throughout the country.

For the implementation of this legislation, public services, such as the Brazilian Agricultural Research Corporation² (Embrapa) were called to contribute with actions directed to the meeting, selection, processing and provision of information about the Forest Code. As the target audience, we can mention the rural producers and entrepreneurs, technicians, extension workers, researchers, students, etc. Within the institutional scope of Embrapa, it is noticeable the lack of virtual environments for the provision of information such as informational multimedia on themes involving the Forest Code.

In addition, regarding the creation of virtual mobile spaces, it is noted the existence of methodological options applied to the production and organization of digital media content, just as there are a variety of tools and technological resources to support the development of software applications in this area.

This context of lack of virtual environments for mobile multimedia at Embrapa, coupled with institutional guidelines for the identification of information technology solutions (IT) appropriate to the adequacy of the rural landscape to the Forest Code, has contributed to the explanation of the research question: what characteristics a digital platform must have to serve as a space of sharing, dissemination of information, collaboration and learning and contribute to the implementation of the Brazilian Forest Code?

Faced with this problem, which is reflected in the lack of a virtual environment to meet the demand of information and knowledge to support the implementation of Brazilian forestry legislation, we proposed the creation of a digital and virtual media platform called e-Códex, using web technologies to the development of applications and solutions for access via mobile devices. The proposal steps were permeated by the search for answers to recurrent questions about the need to organize and provide information and knowledge, such as: A) what methodology should be adopted for creating a digital platform focused on the production and organization of communicational and educational information content, with access via mobile devices? B) What technologies (tools, applications, etc.) should be adopted for creating and structuring this digital platform for access via mobile devices? C) What scope should be defined for the creation of a platform (objectives to be achieved—immersion, agency and engagement in learning; topics/sub-themes to be addressed; competences and skills to be developed, etc.)?

The proposal for a digital mobile platform e-Códex was based on the theoretical framework of hybrid spaces, whose conceptual assumptions foster the development of abilities considered facilitator of the subject interaction in the virtual environment. In turn, the digital technologies used for creating the mobile

²Embrapa is a public company linked to the Ministry of Agriculture, Livestock and Food Supply of Brazil, which has the mission of enabling solutions for research, development and innovation for sustainability of agriculture in favor of Brazilian society. The generation of knowledge, the development of technologies and the dissemination of information are the main strategic objectives of Embrapa (Embrapa, 2014).

platform have been selected taking into account the minimum technical requirements able to promote interaction, collaboration, participation and information sharing, knowledge, experiences, know-how, etc., usually applied to educational and/or communicational digital spaces.

The article is divided into six sections, including this introduction. In Section 2, the education is discussed under the perspective of digital technologies and multimodal learning³, favoring a logical thread for questions and discussions that will be presented in other chapters. Section 3 presents the theoretical aspects that underpin the concepts of space and cyberspace, in particular, the concept of virtual space created for access via mobile devices and locative media, under the perspective of ubiquity, pervasivity, hybridity, and multimodality. In Section 4 we presented the methodology and procedures adopted in the development of the virtual platform proposal. Then, in Section 5 we presented and discussed the results of the survey and the explanation of the proposed digital platform e-Códex. Finally, in Section 6 we presented the conclusions.

2. Digital Technologies and Multimodal Learning

Digital technologies have been considered technological devices of vital importance for education because it facilitates the construction of knowledge among students, especially if associated with a theory sociointeractionist (Ayas, 2006). That indicates educational processes that occur through the technologies and digital tools need to be focused on the possibility for people to build the knowledge based on practice, skills, experiences and culture of the collective of people who are part of the situation (Mayes & Freitas, 2004).

Digital technologies, in particular wireless mobile devices with interactional potential, authorship and collaboration are appropriate to the preparation of projects pedagogical, which aim at helping the apprentice in the construction of knowledge from his own life experience and the context in which it operates (Almeida & Valente, 2012). In an educational process under such characteristics it is assumed that learning should be made from the interaction that people make between them and the way in which they are entered, as occurs in learning. In this type of learning people are involved in various representations of meaning based in various ways and means of language. The multimodal learning constitutes a challenge for educators who need to create routes of interdependent, complementary, open, and multiple learning, to promote in the apprentices engaging experiences and interactions which allow them to explore situations or concepts through observation or collaborative activities. According to Freitas & Neumann (2009), the multimodal learning involves learners in different ele-

³The term “multimodal learning” derives from the studies of Kress & Van Leeuwen (2001) and refers to a learning based on a new form of communication, which is a result of the potential of the digital media for bringing meanings through synchronization of modes. These different modes of representing the meanings inherent to each media, contribute so that learning occurs through discovery, exploration and experimentation, being people the main protagonists. The multimodal learning enables various forms of reasoning, especially if the content is produced to take advantage of the affordances of the media, in a complementary and interdisciplinary, as well as if the platform (virtual environment) is structured to support appropriate technology.

ments of the learning cycle, favoring the transfer of behavior patterns from a context to another.

Multimodal learning approach aligns to the idea of designing a virtual hybrid space, taking it as a potential source of learning in the context of non-formal education. Firstly, because in multimodal learning people can build, share and explore various representations of meanings through narratives essentially shaped to the context of practical situations common to the apprentices. Secondly, in multimodal learning it is possible for apprentices to examine new conceptual trajectories, mobilizing all its resources and cognitive strategies to understand the experience they are experiencing. And finally, the multimodal learning makes clearer the different media in the context of an educational process, not only as channels, but mainly as a means of interaction that promote learning, since they enjoy the best of each one offers (Torres et al., 2015).

3. Spaces

Along the civilizing process, humanity has become socially constituted, creating family, grouping into tribes, villages and communities, generating affectional bonds, developing the language, creating instruments and establishing rules for the conduct of peaceful coexistence, anyway, transforming the nature and culture (Backes, 2013). As said by Maffesoli (1996: p. 234), the nature “is no longer considered simply as an object to be exploited, but it is increasingly a partnership process”.

Through the work, mankind, in his transforming role of nature, gave rise to the creation of instruments, originally designed for fishing and hunting, which with the passing of time were also used as weapons. At all times, both the instruments as the techniques⁴ bring engendered the respect that man establishes with the nature, resulting in the creation of the material conditions for human existence, as well as in the construction of their spaces of coexistence. Thus, since its origin, the mankind follows transforming the reality through the development of tools and techniques, promoting leap of evolution, since the creation of simple utensils for survival, in the early days, to the sophisticated information and communication technology (ICT), in the present day.

Space is a term that encompasses many concepts, which are bound to different areas of knowledge, such as mathematics, cosmology, philosophy, geometry, physics, statistical mechanics and practice, physical mechanics etc. Nowadays, other spaces are created, directed to the perception and the human experiences, and in this perspective, “[...] Space start to have a psychic statute, social and historical that presents an overflowing multiplicity of facets” (Santaella, 2011a: p. 164). Thus, in this space of so-called human experience, are included the primi-

⁴The word technique often mentioned in this text should be understood according to the precepts of Santaella (2010: pp. 152-153), which affirm: “While the technique is a know-how, whose intellectual nature is characterized by skills that are introjected by an individual, technology includes the technique, but goes beyond it. There is technology wherever a device, appliance or machine is capable of incarnating, outside the human body, a technical knowledge, a scientific knowledge about specific technical skills”.

tive space, the perceptual space and the space of existence

3.1. Cyberspace

The intense technological change led in the last two centuries shook profoundly the traditional spaces of human existence, causing significant changes toward the constitution of new spaces of experience. Derived from this context of accelerated social changes and technological innovations, the spaces of communication appear, especially the media communication. As point out by Santaella (2011a: p. 177), this is “[...] a type of space that is not separated from the living, but it weaves. [...] the space created by the networks—the virtual space, global, multidimensional, supported and accessed by computers—came to be called ‘cyberspace’, a term created by William Gibson in his novel *Neuromancer*, in 1984”.

The cyberspace is also defined as an electronic communication system which brings together the humans and computers, in a symbiotic relationship that grows exponentially in an interactive way. It is also designed as any informational space of interaction with the human being, by means of access, handling, processing and interchange of information. In it the communication is convergent, global, planetary. The cyberspace or the network—which is comprised of countless sub-networks—is an open and freedom space, formed by informational circuits infinitely navigable, since the regulatory mechanisms of the capitalist market are respected (Santaella, 2011b). In this sense, cyberspace must be understood not only as a simple consequence of technological progress, but also as a new array of political, economic and cultural rights engendered by the information revolution (Santaella, 2010).

In a not naive vision of the cyberspace, the semiotician Lucia Santaella states:

Finally, far from emerging as a kingdom somehow innocent, the cyberspace and its virtual experiences are being produced by contemporary capitalism and it is necessarily impregnated of cultural forms and paradigms that are peculiar to the global capitalism. The cyberspace, therefore, is far from inaugurating a new emancipating era. Although the internet is revolutionizing the way we live, it is a revolution in which nothing changes the identity and nature of the amount each time more exclusive and a reserved of those who hold the wealth and stay in charge. (Santaella, 2010: p. 75).

Under another dimension, the access to cyberspace by people who surf on the virtual spaces is done via mobile devices, i.e., cell phones and tablets, considered the main instruments of communication and interaction. As the same way, the locative media⁵ are endowed with technical elements capable of exerting influence on the reconfiguration of virtual and physical spaces and to promote the construction of narratives, allowing combinations of aspects of the technique, the space and the narrative, with impacts of one over the other.

⁵Locative media is a term coined by Karlis Kalnis, from the Center for New Media, Riga, Latvia, in 2003. According to Lemos (2007: p. 1), locative media are processes of emission and reception of information from a specific place, which implies a relationship between places and mobile devices.

Mobile communications devices reinvent urban spaces such as multi-users connected regardless of geographical position and physical presence, favoring the emergence of hybrid spaces, i.e., defined by the disappearance of borders between physical and virtual and created by the constant mobility of users who use mobile devices (Caetano Nêto, 2011: p. 1).

The mobile devices represent the technique because they result from production processes based on the increase and development of technique and technology. In addition, we use and deal with sociotechnical spaces for construction of new narratives. According to Backes (2007, 2011, 2013), digital technologies, among which include mobile devices, are also understood as virtual and digital spaces, because “[...] allow the action, relation, interaction and sharing of representations of human beings [...]” (Backes, 2013: p. 4).

In this sense, new virtual spaces are liable to be created, thanks to hybrid character of digital technologies, which consists of crosses, integration and articulation of different technological gadgets and artifacts (digital media), in view of the existence of relations between human and no-human actors.

Next, concepts as ubiquitous, pervasivity, hybridism and multimodality are briefly presented. They are considered elements which characterize the cyberspace and, therefore, essential in the configuration and creation of any virtual spaces, as it is the e-Códex.

3.2. Ubiquity and Pervasivity in Virtual Spaces

In the perspective of geographical studies, the configuration of space is defined by Santos (1980: p. 122) “[...] as a set of shapes representing social relations of past and future [...]. The space is, then, a true field of forces whose acceleration is unequal. That is the reason why the space evolution is not identical across all places”.

Ubiquity and pervasivity are “[...] basic premises for a new configuration of urban space, where wireless technologies are popularized in order to generate a pattern of nomadic life” (Caetano Nêto, 2011: p. 1). Ubiquity is defined as the property or condition of what ubiquitous is, what it means, the ability to be in several places at the same time. For its turn, pervasivity is a term that refers to the pervasive computing, in which “[...] the technologies dissipate in the day by day stuffs until they become indistinguishable [...]” (Caetano Nêto, 2009: p. 32), providing access all the time, anywhere, and whenever you want.

Pervasivity brings imbricate the concept of locative media, which are defined by Lemos (2007: p. 1), as “[...] a set of technologies and info-communicational processes whose informational content links to a specific place”. The locative media are, therefore, technologies responsible both for issuing and receiving information from one location, using mobile devices that process data and information, generating analysis and adding them to this place.

The use of mobile devices, particularly associated to locative media directly corresponds with technological development, which continuously introduces changes in how society organizes itself, faking the appearance of new concepts about the relationship between space, time and city, especially. New social con-

figurations based on the relations between these elements “[...] significantly change our way of living, thinking and consume information” (Caetano Nêto, 2011: p. 3).

There are many examples of application of pervasive computing aimed at creating virtual spaces, using mobile technologies, and that bring new settings in order to live, to think and to consume information. In this way, it seems appropriate to introduce here a brief discussion about the hybridity and multimodality in virtual spaces, under the perspective of the intrinsic mobility referring to mobile devices.

3.3. Hybridism and Multimodality in Virtual Spaces

The term hybridity has its origin in biology, being normally used to refer to a hybrid character of genetic species originating from different species (Canclini, 2006). Meanwhile, hybridity is a phenomenon that extends to other areas of knowledge, as the language. In this field, hybridity is attributed to the formation of words through the junction of radicals belonging to different languages, as is the case of “automobile”, whose radical “auto” has Greek origin, and the radical “mobile” Latin origin.

Based in Latour (1994), Caetano Nêto (2009: p. 44) says that hybrid “[...] is a term easily used with the aim of providing a quality less ‘pure’ or unilateral to things”. From Latour’s conception it is understood that hybrid is a phenomenon that is by multiple arrays and mixtures of nature and culture, from interactions that occur inextricably between actors human and non-human.

Hybridity is also presence in the media, above all, from the first decade of the 21st century, when we see a fast incorporation of mobile communication devices in both physical and virtual environments. In terms of evolution, this phase corresponds to the fifth generation of the communicational technologies, in which we witness the fast incorporation and symbiosis of mobile devices in communication. The antecedent phases, briefly, are: the means of mass communication (first generation); the electro electronics (second generation); the appliances, devices and processes of communication narrow casting (third generation); the personal computers linked to information technology networks (fourth generation) (Santaella, 2011a).

As a result, it appeared that hybridity also articulates and integrates the field of digital technologies, coming to form what is called a digital and virtual hybridity. In other words, this junction is “[...] a coherent set of possibilities of realization of the human action in a space of virtual digital nature, by means of digital technologies” (Backes, 2013: p. 8).

Thus, in a context of hybridity, the interaction and communication flow in an articulated manner so that each virtual digital media and/or space perform their functions, using different languages (text, audio, visual, gestural) or mixtures and combinations between them, i.e., of languages and hybrid transmedia (Santaella, 2009; Torres et al., 2015). Following Santaella (2010), the main bases of digital hybridity remain in the convergence of media, formerly separated, and in relation prompting between the human being and the text and/or hybrid

space. And nothing better to describe contemporary culture than the concept of hybrid, which according to Santaella (2011b: p. 132) underlies “[...] the mixtures between the media, under the name of multimedia, and for mixtures between systems of signs, various and different languages configured in hypertextual structures, under the name of hypermedia”.

It is conceived, thus the digital spaces such as stages of actions and interactions that are established between human and non-human actors, including mobile devices, forming relationships that are inseparable and networks that connect to nature, technique and culture. Naturally, in times of predominance of social networks, interactions⁶ in digital spaces have evolved from monomodality to multimodality, making it necessary to briefly comment this transition.

A characterization of the monomodal interaction is given by Santaella (2010), by employing the metaphor of surfing and browsing time—thus the timelessness of cyberspace—which presupposes a beginning and an end, corresponding to the phase of organization of information from the constitution of files and repositories for access in accordance with dates and times previously established. This phase corresponds to the beginning of the interactions in the network (1990), and is referred to as monomodality, according to its character and unidirectional nature of its journey, which is always the same, and yet, the type of access that occurs by means of fixed points in the dimension of time and space. In the monomodal phase it is common to associate the digital navigation on the network to a course similar to “[...] a huge maze, where we need to find many streets without exit before we meet our goal” (Santaella & Lemos, 2010: p. 56).

The monomodal interaction occurred at the beginning in the late 1990s follows its evolutive course, opening passage to the multimodal interaction, which consolidates itself as from 2009, with the emergence of Twitter in social networks 2.0. Thus, in multimodal phase the advances in digital communications are significant, as the incorporation of functionalities in the same interface, such as: exchange of messages between members of the discussion group, collective messages, comments, forums, chats, collective framework of errands, collective repository of documents etc. In other words, in this phase of transition to multimodality there was the incorporation of multiple features of interaction of monomodal type, which became part of the same platform (Santaella & Lemos, 2010).

A differentiating element of interaction in multimodal refers to mobility introduced with the hybridization of applications, spaces and digital technologies, such as mobile devices, particularly mobile phones and tablets, greatly expanding the possibilities for access of people to content and virtual environments, regardless of place and time.

In this way, it would be unthinkable to design the construction of a digital platform, such as the e-Códex, disregarding the elements discussed previously, such as: ubiquity, pervasivity, hybridity, and multimodality. In addition, these elements also refer to the implementation of teaching and learning activities in

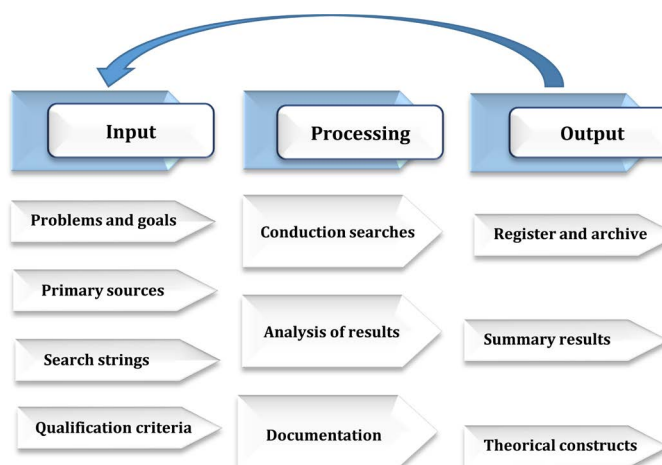
⁶Santaella and Lemos (2010) suggest two types of interaction characterizers of virtual spaces: monomodal interaction and multimodal interaction, which represent distinct stages of evolution social networks (RSIs).

virtual environments. These are essential questions that will be in the proposal for e-Códex platform presented and discussed on chapter five.

4. Methodology

This is a survey of exploratory and descriptive and qualitative approach, developed at Embrapa Agricultural Informatics⁷, under the Special Project Forest Code⁸, aiming at the construction of a digital space to share and disseminate informational content, to promote collaboration and learning. The research was carried out in two phases. The qualitative phase has as main objective the identification, from a review of the literature of some theoretical and conceptual constructs, in topics that involve the cyberspace, the digital media and education in virtual spaces, in order to subsidize the development of a digital platform to support the actions relating to the Special Project Forest Code of Embrapa. The phase of research had as main objective to identify, along with members of the Special Project Forest Code the perceptions and the requirements of interaction in a digital virtual space, in order to favour a horizontal and dialogic relationship, conducive to new learnings.

The collection of data from the qualitative phase followed the steps described in **Figure 1**. In this **Figure 1**, the three phases involved in data collection are represented as “Input”, which concerns of the problems and goals, primary sources, search strings and qualification criteria; “Processing” which consists of the realization of searches, analysis of results and documentation; “Output” which includes of the register and data storage, synthesis of results and elaboration of the theoretical constructs.



Source: Adapted by of Conforto et al. (2011).

Figure 1. Model of systematic literature review.

⁷Embrapa Agricultural Informatics is a unit of research in information technology applied to agriculture in the areas of software systems engineering, scientific computing, communications technology, bioinformatics and agroclimatology (Embrapa Agricultural Informatics, 2016). It has institutional mission to provide solutions for research, development and innovation in information technology for the sustainability of agriculture in favor of Brazilian society (Embrapa, 2011).

⁸Forest Code Project is the special project of Embrapa, called Technological Solutions for Adequacy of the Rural Landscape to the Brazilian Forest Code, which includes, among others, the line of research “Provision of Information Technology Tools to Assist in Adequacy to the Brazilian Forest Code”.

Once adjusted the criteria established in entry phase, the procedure have been adopted for the implementation of the processing phase: a) search in databases and periodicals; (b) Selection of reading of the collected material (1st selection consisted of the identification of title, abstract and keywords; 2nd selection consisted in reading the introduction and the conclusion of the selected documents by title, abstract and keywords; 3rd selection corresponded to the complete reading of selected documents in the second phase: reading of the introduction and conclusion); c) synthesis and results abstracted from the complete reading of the documents. The third phase consisted of identifying the theoretical constructs that were abstracted from the registry held at the stage of processing and contents of these records.

To perform the data collection in phase of research, it was developed a multiple choice questionnaire⁹, of type Likert scale (Bozal, 2006). The questionnaire was applied online to 123 people, members of the Special Project Forest Code. There was no information about the subject's profile characterization. From 123 people who composed the research universe, we obtained the answer of 61 people (49.5% of the universe). This questionnaire used as a basis the constructs abstracted in the qualitative phase of the study, referring the characteristics that should guide the design of a digital platform, whose goal is to foster collaboration, sharing, dissemination and learning.

Four important constructs that guide the development of a digital platform were defined. The first, called generic construct, seeks to understand how much the research subjects consider important to create a digital platform to disseminate information, promote collaboration and learning about issues inherent to the Forest Code and the degree of importance they attach to it.

The second construct refers to the characteristics that a platform of sharing/dissemination, collaboration and learning must have to fulfill its objectives and the degree of contribution that such characteristics could provide to the subjects that access.

The third construct is linked to the use of the platform, i.e., identifies whether the subjects who would access the platform, would do it for sharing/dissemination of information, cooperation with partners in discussions on the theme or for learning/achievement of knowledge.

The fourth construct is on how they the contents and the activities should be arranged on the platform.

The quantitative data were processed through the analysis of correspondence which is a multivariate technique for exploratory analysis of categorized data (Carvalho et al., 2002). The technique of correspondence analysis converts an array of non-negative data in a particular type of chart/map that allows us to visualize "[...] the proximity/distance and the relationships between rows and columns (stimuli) of a contingency table (usually also called cross table, crossing, crosstab), in two or more dimensions" (Cunha Jr., 2000: p. 34). This enables the relationship between the lines between the columns and rows and columns can

⁹Questionnaire created using Google Forms, available in <https://goo.gl/JL81IK>

be interpreted. This technique was chosen because, besides being more appropriate for the type of data collected in this survey of descriptive nature, it also promotes the versatility in the treatment of categorical variables and makes it easier the implementation and interpretation of the results.

5. Results and Discussion

5.1. Presentation and Data Analysis

Data analysis was preceded by the use of graphs to visualize the relationships between the variables. At representing a set of points, the absolute frequencies of each line were not observed, but the profile of a line along the categories of the columns. At introducing the profiles, the points were standardized, thus reducing the information to according to the individuals in each line (Carvalho et al., 2002).

For obtaining the axes, we observed the accumulated percentage of main inertias and, based on the percentage explained by inertia, we calculated the number of axes required for the representation of points (Table 1) (SAS Institute Inc., 2008). As can be seen in this context, the total of the statistic chi-square test is 846.67, which is a measure of association between the rows and columns in all dimensions of the data table transformed, obtained by the decomposition of natural values. About 29% of the statistic chi-square test and inertia is explained by the first vectorial axis, while about 20% is explained by the second vectorial axis (as can be seen in the chart to the right of the table). In this study, the points were represented in two axes, indicating that the association between rows

Table 1. Decomposition of inertia and chi-square test. Analysis of correspondence for the variables.

Singular Value	Principal Inertia	Chi-Square	Percent	Cumulative %	
0.42394	0.17972	245.679	29.02	29.02	6
0.35106	0.12235	168.477	19.00	48.92	12
0.29319	0.08596	117.505	13.88	62.79	18
0.25159	0.06330	86.527	10.22	73.01	24
0.23737	0.05634	77.020	9.10	82.11	30
0.20736	0.04300	58.778	6.94	89.05	
0.12495	0.01561	21.342	2.52	91.57	
0.11845	0.01403	19.179	2.27	93.84	
0.09922	0.00985	13.459	1.59	95.43	
0.08321	0.00692	9.464	1.12	96.55	
0.07819	0.00611	8.356	0.99	97.53	
0.06503	0.00423	5.781	0.68	98.22	
0.05576	0.00311	4.250	0.50	98.72	
0.04945	0.00245	3.343	0.39	99.11	
0.04467	0.00200	2.728	0.32	99.44	
0.03868	0.00150	2.045	0.24	99.68	
0.03326	0.00111	1.512	0.18	99.86	
0.02379	0.00057	0.774	0.09	99.95	
0.01806	0.00033	0.446	0.05	100.00	
Total	0.61936	846.667	100.00		

and two-dimensional columns, with 49% of the inertia explained. As the other dimensions were smaller, there was no loss of information when only two dimensions were considered.

In the interpretation of the axes, it was found that the inertia of the points decomposes itself on each axis. The components of the inertia form the coefficients that indicate how much each point contributed to determinate the direction of the axes and how much each item is represented in each axis indicated by the coefficients C1 and C2, as seen in **Table 2** below.

Table 2 displays the coordinates of the variables for the two axes and their

Table 2. Summary of statistics for the variables of the study. Analysis of simple correspondence.

Obs	Name	Axis 1	Axis 2	C 1	C 2	QR 1	QR 2	Best
1	q1	- 0.20786	- 0.01526	0.00756	0.00006	0.40657	0.00219	1
2	q2	- 0.19344	- 0.10015	0.00975	0.00381	0.26333	0.07059	1
3	q3a	- 0.18908	- 0.00240	0.00611	0.00000	0.34305	0.00006	1
4	q3b	- 0.19256	- 0.00482	0.00604	0.00001	0.20569	0.00013	1
5	q3c	- 0.18782	- 0.04389	0.00574	0.00046	0.20467	0.01118	1
6	q4a	-0.17549	- 0.10569	0.00489	0.00259	0.14706	0.05334	1
7	q4b	-0.16225	- 0.02103	0.00793	0.00019	0.09061	0.00152	1
8	q4c	- 0.18561	- 0.07061	0.01641	0.00346	0.17544	0.02539	1
9	q4d	- 0.13761	0.13029	0.00863	0.01129	0.04022	0.03605	2
10	q4e	0.29580	- 0.38101	0.03205	0.07755	0.07142	0.11850	2
11	q4f	2.46496	0.90804	0.29678	0.05873	0.53095	0.07205	1
12	q4g	- 0.03304	- 0.11913	0.00096	0.01828	0.00355	0.04612	2
13	q4h	1.47169	- 0.31301	0.56422	0.03722	0.78177	0.03536	1
14	q5	- 0.19393	- 0.07619	0.00934	0.00210	0.19680	0.03037	1
15	q6a	- 0.22689	- 0.14507	0.01173	0.00700	0.20164	0.08244	1
16	q6b	- 0.13716	- 0.15191	0.00475	0.00849	0.15162	0.18597	2
17	q6c	- 0.11051	- 0.23292	0.00204	0.01320	0.02868	0.12740	2
18	q6d	- 0.05884	- 0.04505	0.00066	0.00057	0.01223	0.00717	1
19	q6e	0.12376	- 0.03556	0.00349	0.00042	0.07208	0.00595	1

Legend of variables:

- q1 – The importance of the creation of the digital space.
- q2 – Degree of importance attributed to the digital space of the Forest Code Project.
- q3a – Use of space to learn/gain knowledge from interactions with other people.
- q3b – Use of space to collaborate with other people in discussions about the Forest Code.
- q3c – Use of space to share/disseminate information.
- q4a – Characteristics of interactivity: notification of reports, journalistic materials, statements and/or other texts related to themes inherent to the Forest Code.
- q4b – Interactivity characteristics: invitations to events (fairs, workshops, seminars, congresses, field days, lectures, etc.) related to themes inherent to the Forest Code.
- q4c – Interactivity characteristics: repositories of multimedia resources (videos, slides, infographics, photos, podcasts, etc.) related to themes inherent to the Forest Code.
- q4d – Interactivity characteristics: interaction space (blog, forum, comments, chat, twitter) with members of e-Códex.
- q4e – Interactivity characteristics: open access space to know the profile and electronic address of the members.
- q4f – Interactivity characteristics: space to schedule appointments.
- q4g – Interactivity characteristics: distance learning courses.
- q4h – Interactivity characteristics: access to social networks.
- q5 – Contribution of the characteristics to favor the sharing/dissemination of information, collaboration and learning between people.
- q6a – Organization of contents and activities to promote the synthesis of essential concepts.
- q6b – Organization of contents and activities in a clear, direct and simple way.
- q6c – Organization of contents and activities to attract my attention (colors, movements and other stimuli) to facilitate my assimilation.
- q6d – Organization of contents and activities to explore new contents and information to complement the subject presented.
- q6e – Organization of contents and activities to enable the exchange of information with colleagues who participate in the digital space.

contributions and quality of representation: the variables q1, q2, q3a, q3b, q3c, q4a, q4b, q4c, q4f, q4h, q5, q6a, q6d and q6e show greater contribution to the first axis, while the variables q4d, q4e, q4g, q6b and q6c for the second axis (**Figure 2**).

In the same table, the quality of its representation, indicated by the coefficients QR1 and QR2, can also be seen. The quality of representation is the coefficient that indicates how much each point is, or is not, well represented in the considered subspace.

How the correspondence analysis allocates points in a Euclidean space, the projections of the points on the axes us to draw conclusions about their similarities or dissimilarities. The results from **Table 1** and **Table 2** allow the generation and interpretation of **Figure 2**, defined by the coordinates of the first two vectorial axes.

The combination of the results obtained in the qualitative phase of the study (theoretical constructs) with the results of the interpretation of variables similarity contained in the **Figure 2** allow the analysis that follow in section 5.2 below. As the first axis of **Figure 2** has contributed with 29% of the explanation of chi-square and inertia, the variables which are in this axis will be the ones analyzed in each of the theoretical constructs.

5.2. Presentation of the Results

5.2.1. Importance of e-Códex Platform

Nowadays, companies seek to expand its capacity for technological innovation, in a manner of producing new products and introducing constant improvements in the production process to ensure greater flexibility, productivity and competitive advantage.

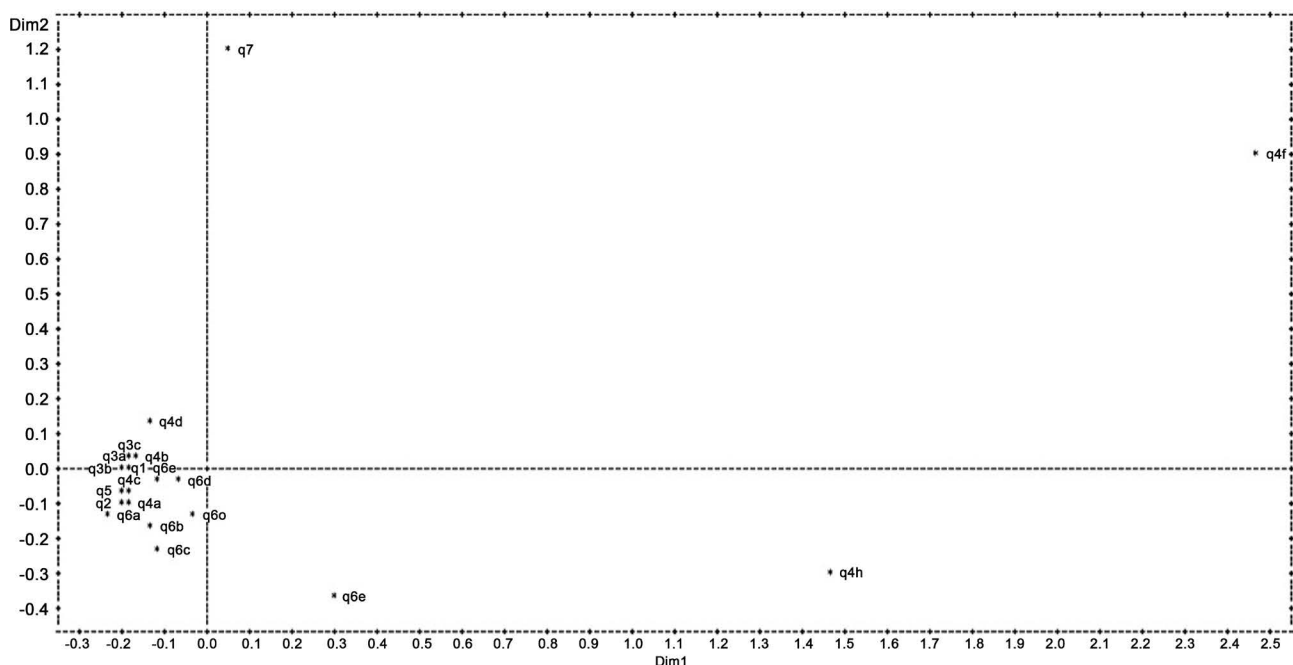


Figure 2. Map of simple correspondence with the variables defined in **Table 2**.

There is, in the organizational sphere, the recognition that information and knowledge are one of the forms of companies to promote innovation. In this sense, they have made efforts to intensify the use of digital technologies to form, empower and/or qualify people in order to promote a horizontal communication and dialog with the stakeholders (Lastres, 1994; Kuhlen, 2003). The portability of the technological artifacts of communication, combined with the ubiquitous expression and the aspect of connectivity, enhances the ability of people to produce, consume and spread more information (Sheller & Urry, 2006; Lemos, 2007).

The understanding of the perception of research subjects about the importance of a digital platform for Embrapa is one of the first steps to start its construction. In this sense, the variables q1 and q2 have measured that the research subjects admit it is important to build virtual spaces in the company.

This result corroborates the opinion of specialists (Primo, 2003; Rebollo-Catalán & Vico-Bosch, 2014), who consider the current ICT as a means of promoting new relationships between people, making them interacting. For Embrapa, this result means a signal for the necessary construction of a collective space for collaborative participation, destined to the exchange of information and knowledge and learning between members of this environment. Recuero (2000) points out that virtual environments, as e-Códex, are the consequence of the interaction between the human and the cyberspace because they are structured by the common interest of its members who adopt a communicative interaction as the primary means to form social groups which, although they have as its starting point the virtual space, extend beyond it.

5.2.2. Characteristics and Contributions of the e-Códex Platform

Nowadays, there is a kind of bidirectional dynamic communication enhanced by digital virtual tools, among which stands out the Facebook, Wikipedia, Twitter, virtual communities etc. Digital platforms based on principles of design contribute to enlarge the possibilities of information sharing, collaboration and collective action of people (da Silva, 2010; Mattar, 2011; Spagnoletti et al., 2015).

e-Códex is one of the platforms that can be understood as a 'virtual community', since its main focus is human interaction, perceived as a whole organic, i.e., an environment in which people exert a synchronous communication, whose relations are sustained by affectional bonds and union (Tönnies, 1955). In accordance with Gawer (2009), quoted by Spagnoletti et al. (2015: p. 364), digital platforms are configured as "[...] the building block that provides an essential function to the technological system and serves as the foundation upon which complementary products, technologies, or services can be developed."

One of the main characteristics of digital platforms, according to Baldwin & Woodard (2008: p. 7), is the existence of "[...] certain components remain fixed over the life of the platform, while others are allowed to vary in cross-section or change over time. Thus either by design or simply because it is the longest-lived component in the system, the platform embodies a set of stable constraints, or design rules, that govern the relationships among components".

In this sense, Spagnoletti et al. (2015: p. 4) affirm that “the digital platform exhibits the layered modular architecture in which elementary IT capabilities are grouped into software applications that are combined to satisfy generic functional specifications that meet the needs of multiple, de and growing user communities”.

Considering the technological advances in the area of IT, virtual environments such as e-Códex must follow this logic, and mainly rely on an architecture design of innovative platform and capable of structuring social interaction in order to provide, by means of a communication, dialogical and horizontal, information sharing, collaboration, collective action and mutual learning between people.

For the research subjects, the structure of interaction that the platform e-Códex should adopt so that be favored the relations between people is enshrined in the variables q4a, q4b, q4c, q4f, q4h and q5, representing degree of similarity of 29%, as observed in the first vectorial axis of **Figure 2. Table 3** shows each of the variables with their respective degrees of contribution.

The responses of the subjects showed that the construction of a platform with the objective of e-Códex should have as central point a structure of social interaction. This means opting for a technological design of environment which fosters in the interactors the information sharing, exchanging ideas and knowledge, the development of collaborative work and collectives of common interests. Spagnoletti et al. (2015) argue that the design of a digital platform should be appropriate to the interests for which the environment has been created. In this sense, the design of the platform runs through the construction of conceptual architectures and technology aligned with each other. These authors propose three sets of interaction to be covered by digital platforms: information sharing, collaboration and collective action.

In the interaction of the type “information sharing”, the platform must offer technologies that promote and strengthen volunteer actions between the interactors who access it, giving them freedom of definition about what should or

Table 3. Platform characteristics.

N° of variable	Variable description	Contribution
q4a	Notifications of news reports, stories, testimonies and/or other texts related to themes inherent to the Forest Code.	0.00489
q4b	Invitations to events such as fairs, workshops, seminars, conferences, field day, lectures etc.) related to issues inherent to the Forest Code.	0.00793
q4c	Repositories of multimedia resources (videos, slides, infographics, photos, podcasts etc.) related to issues inherent to the Forest Code.	0.01641
q4f	Space for commitments schedule.	0.29678
q4h	Access to social networks	0.56422
q5	Contribution of characteristics for facilitating the sharing/dissemination, collaboration and learning.	0.00934

should not be made available on the platform. In the interaction of the type “collaboration”, the digital tools to be implemented on platform should allow that the sharing of information be directed to common objectives. Thus, the design of the platform should contemplate the possibility of the managers of the platform to coordinate the actions performed by the interactor, because in collaboration, people exchange experiences, discuss collective actions and learn from each other, what requires a work of coordination, monitoring and verifying of what was executed by members of the community. The interaction of the type collective action is an interaction more complex that will require technological tools that emphasize the broad participation, involvement and commitment of the interactors who access the platform. The interaction of the type “collective action” is installed when people have already established bonds of trust with each other and are willing to explore more clearly its rationality and ideologies. It is what happens in virtual platforms adopted by social movements, political parties and governments, whose interests are more focused on the promotion of collective and consensual actions.

5.2.3. Use of the e-Códex Platform

In institutions for research, development and innovation (PD&I), as Embrapa, the creation of digital platforms is seen beyond a jumble of technological artifacts, but, as a space of intelligence that contains an important substrate for reflection on themes of common interest (Alves, 2014), which serve to leverage the creation and dissemination of knowledge.

At Embrapa this understanding has been guiding the definition of strategies to promote the area of PD&I. Among the strategies we can mention the construction of technological tools to boost innovation and the transfer of information and technology; create, maintain and expand streams, canals and formal spaces and informal dialog and reciprocal influence between the public affairs of the institution; strengthen the strategic intelligence organizational and establish a policy of participatory management. This company’s interests necessarily passes through the establishment of communication channels of dynamic character, based in collaborative premise, able to offer, on the one hand, greater adherence to its mission and institutional objectives and, on the other hand, the possibility of promoting/increase the generation and dissemination of new knowledge, knowledge, experiences and learning among researchers.

The e-Códex is, therefore, one of those channels of communication designed to support the construction, storage and dissemination of information and knowledge pro-produced by Embrapa, i.e., a locus of interaction and collaboration between researchers and their target audiences, internal and external. According to Evers (2002) and Jones (2001), environments of this nature are more than necessary because the knowledge, raw material of the institutions of PD&I, is fed with knowledge. The existence of a space for sharing, stimulates and handle the exchange of ideas, suggestions, experiences, knowledge and know-how between people, serving as an instrument of potentiating learning individual and collective housing (Nonaka & Konno, 1998; Choo, 1996; Alvarenga Neto & Bar-

bosa, 2007).

The points highlighted by the literature about the use of digital platforms in institutions PD&I are reinforced by the perception of research subjects, as shown in the variables with degree of similarity of 29%, indicated in the first axis of the chart. The subjects of the research indicated that the e-Códex should primarily be used to: a) to learn/get knowledge from interaction with other people; b) to collaborate with others in discussions about the Forest Code; c) to share/disseminate information.

5.2.4. Form of Contents Organization and Activities on e-Códex Platform

Virtual communities as the e-Códex require the intentional organization of contents e activities to promote the achievement of the objectives for what it was created to (Torres & Amaral, 2011). They require, as already discussed, a design of technological platform that fosters relationships between the main and a dialogical communication, horizontal and interactive that prioritizes the reciprocity in relationships.

One of the main functions of the virtual community is to propel the learning between people. To do this, you must contemplate the necessary resources and organize the processes that allow people to interact with each other and learn from each other, considering the issues and common interests. Virtual communities should provide their members sharing information and collaborative learning, which is why it has been one of the favorite options of interaction by the institutions of PD&I, that consider them as “carriers of winds of change, of expectations of innovation, hopes of improvement” (Coll et al., 2010: p. 269) and learning.

It is in interaction with each other and with the means, according to the Vygotsky's conception, that the learning occurs. To learn is to build senses and meanings from the polyphonic dialog produced by the presence of several voices in the discourse (Castro & Ribeiro, 2010). The basis of virtual communities is the dialog and this is present in the act of communication that, by context, is the source of learning (Martin & Parker, 2014). Therefore, it is necessary to plan the technical conditions that the platform will offer to the interactors in a way which allows that those three elements be convergent, harmonized and integrated into the community e-Códex, from the perception signed by the research subjects.

The data collected in this survey pointed to three variables (q6a, q6d and q6e), which refer to forms of organization of contents and activities on the platform and belong to the first axis of **Figure 2**, whose degree of similarity is 29%. The variable q6a refers to the organization of contents and activities in e-Códex, in order to offer a summary of key information about the Brazilian Forest Code to interactor in the community. The variable q6d indicates the need of the platform e-Códex allow the interactor explore new information, aiming at interdisciplinary complement between different sources of information. Finally, the variable q6e and reflects the importance that the e-Códex should assign to the aspirations of the interactors to carry out information exchanges, knowledge, and know-how.

5.3. e-Códex Digital Platform for Mobile Applications

The development of the platform e-Códex to house the virtual mobile space, in relation to the aspects of information technology (IT), was based on basic premises for setting up digital spaces, virtual as the ubiquity, pervasivity, hybridity, and multimodality, previously discussed.

With regard to the aspects of design, the construction of space e-Códex was based on the people's perception collected from the target audience of a virtual environment for carry out experiences of sharing, dissemination, collaboration and learning, under the scope of the Project Forest Code.

Thus, the requirements of the platform e-Códex aim at encouraging the development of two interdependent systems: the website and mobile application.

The website provides a digital platform that combines a core of services and interfaces that enable the sharing of information. This website implements functions of registration of digital content, including its metadata, the definition of trails (content in shackles) and a web service that will provide services of data consumption from the list of content/metadata, which will be presented by the mobile application.

The web service is a solution that makes it possible that different types of applications, running on many platforms and operating systems, can interact and exchange information in a safe and transparent way. This web service will provide the link between the mobile application and the information stored on the website.

The module for mobile devices of e-Códex has as main objective to be the means by which the public will have access to all content produced and organized by the platform. The technology [Adobe PhoneGap \(2016\)](#) was used for the development of the mobile application. It is an open source distribution of the framework [Apache Cordova \(2015\)](#). This technology allows us to encode in a single language and from this code an application that runs on a specific platform can be generated, as Android, iOS and Windows Phone, without having to write native code for each of these platforms. The applications created with that technology are called hybrids, because they have a piece of code native to the platform and another part is web-based (HTML5, CSS3, and JavaScript). This approach allows an application to be developed with versions for several different platforms with less effort.

Figure 3 illustrates the main functionalities supported by the Web module and the mobile application (App). The application (App) has two blocks of functionalities referring to user's registration and access to the digital content available.

Among the features of the application, the entry point is a field of research (search). When the user engaging, the research from a typed text, it will be performed a search in metadata of all content. The results of a query will be displayed and the user will have the option to view them online or download them (for cases in which the user needs to access the content in such a way off-line). The application will also have an area in which it will be listed all content already

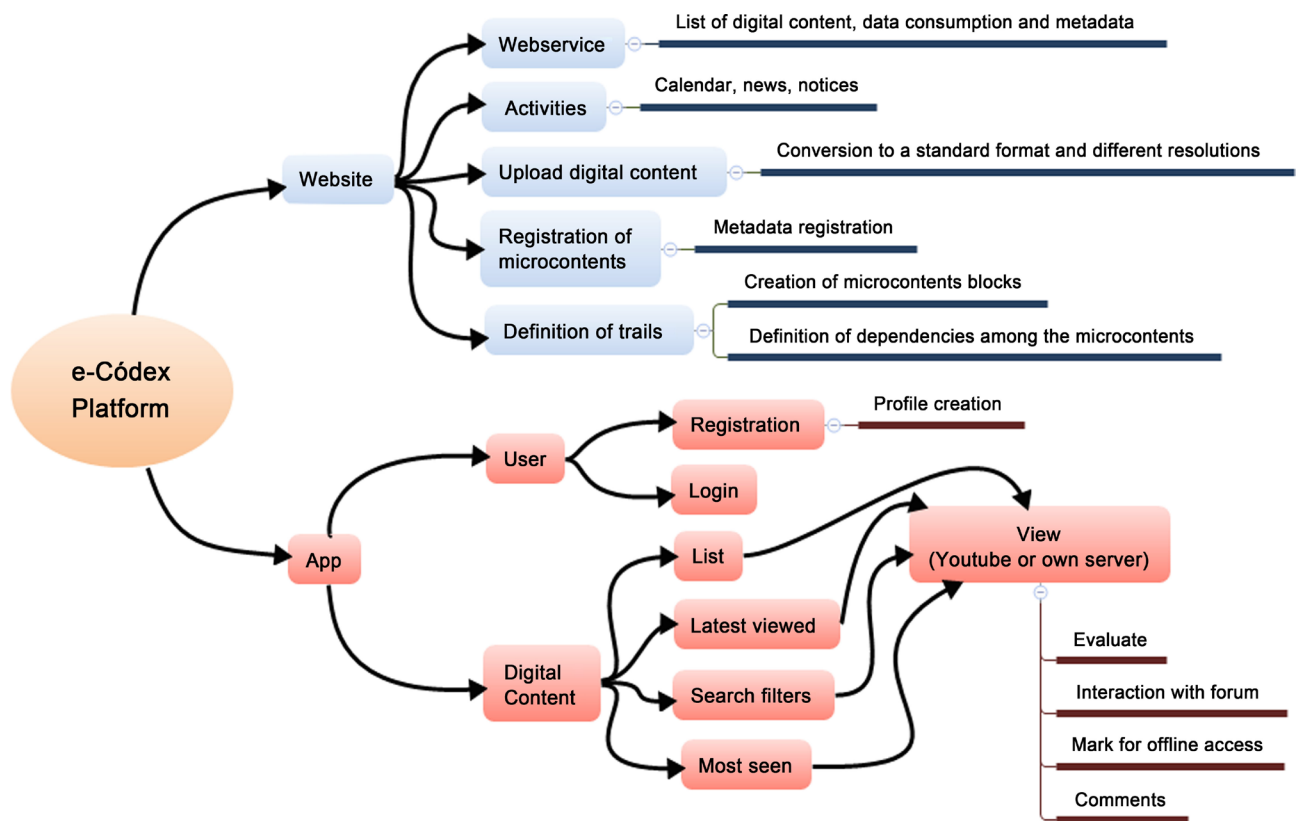


Figure 3. Architecture of the e-Códex Platform.

displayed by the user. In another area, there will be suggestions for content that are related to content that the user has already viewed. So that the user can stop the use and be able to return at any time, an important feature is to allow him to continue viewing content from the exact moment from where he stopped on the last access.

As a way to ensure that contents have a relationship of dependence, i.e., to watch the video B is required to have watched the video A, the application implements this restriction when there is this type of dependence between the content. Collaboration is encouraged in the application with the options of “like/dislike”, and comments for each content, and also from a forum that can be created and supplied by users to discussions about a particular content.

Figure 3 depicts the architecture for the platform e-Códex.

6. Conclusion

The construction of the platform e-Códex was mirrored on the perceptions and interests of interactors, properly analyzed and discussed in the light of the theoretical and conceptual ordinances, relating to the establishment of a virtual space facing the implementation of actions of educational and communicational, within the scope of the Project Forest Code. In this sense, the platform e-Códex incorporates important aspects revealed by interactors, as the need of its creation; its main characteristics and contributions; the possibilities of use; and, the forms of organization of content and activities offered.

In turn, the digital technologies employed in the construction of this mobile platform were selected on the basis of minimum technical requirements able to promote interaction, collaboration, participation and sharing of information, knowledge, experiences, etc., usually applied to digital spaces educational and/or communicational.

Supported by the theoretical framework of education and in particular of cyberculture, with emphasis on aspects of ubiquity, pervasivity, hybridity, and multimodality of virtual spaces, the construction of the platform e-Códex is materialized as a technological tool to support the development of abilities which favour the interaction of individuals in the virtual environment.

References

- Adobe PhoneGap (2016). *Build Amazing Mobile Apps Powered by Open Web Tech: Create Your App with PhoneGap*. San Jose, CA: Adobe PhoneGap.
<http://phonegap.com>
- Almeida, M. E. B., & Valente, J. A. (2012). Integração currículo e tecnologias e a produção de narrativas digitais. *Currículo sem Fronteiras*, 12, 57-82.
<http://goo.gl/z0oqTs>
- Alvarenga Neto, R. C. D., & Barbosa, R. R. (2007). Práticas de gestão do conhecimento no contexto organizacional brasileiro: Rumo à gestão de contextos capacitantes. In Enancib, *VIII Enancib—Encontro Nacional de Pesquisa em Ciência da Informação* (19 p.). Salvador: Ibict.
<http://enancib.ibict.br/index.php/enancib/viiienancib/paper/viewFile/2891/2019>
- Alves, P. A. B. (2014). *Características e usos das plataformas colaborativas no contexto da pesquisa científica: Proposta a pesquisadores da área ambiental* (72 p.). São Paulo: USP/ECA.
<http://grupo-ecausp.com/digicorp/wp-content/uploads/2015/05/Paulo-Andr%C3%A9-Barros-Alves.pdf>
- Apache Cordova (2015). *Mobile Apps with HTML, CSS & JS: Target Multiple Platforms with One Code Base*. Los Angeles, CA: Apache Cordova.
<https://cordova.apache.org>
- Ayas, C. (2006). An Examination of the Relationship between the Integration of Technology into Social Studies and Constructivist Pedagogies. *The Turkish Online Journal of Educational Technology—TOJET*, 5, 14-24.
- Backes, L. (2007). *A formação do educador em mundos virtuais: Uma investigação sobre os processos de autonomia e de autoria*. 186 f. Dissertação (Mestrado)—Programa de Pós-Graduação em Educação, São Leopoldo: Universidade do Vale do Rio dos Sinos—Unisinos.
- Backes, L. (2011). *A configuração do espaço de convivência digital virtual: A cultura emergente no processo de formação do educador*. 362 f. Tese (Doutorado)—Programa de Pós-Graduação em Educação, Universidade do Vale do Rio dos Sinos—Unisinos, São Leopoldo: Co-tutela em Science de l'Éducation, Université Lumière Lyon 2.
- Backes, L. (2013). *Hibridismo tecnológico digital: Configuração dos espaços digitais virtuais de convivência*. LE@D, out. Unpaged.
<https://repositorioaberto.uab.pt/bitstream/10400.2/3050/1/bridridismo.pdf>
- Baldwin, C. Y., & Woodard, J. (2008). *The Architecture of Platforms: A Unified View* (31 p.). Boston, MA: Harvard Business School.

- http://www.hbs.edu/faculty/Publication%20Files/09-034_149607b7-2b95-4316-b4b6-1df66dd34e83.pdf
<https://doi.org/10.2139/ssrn.1265155>
- Bozal, M. G. (2006). Escala mixta Likert-Thurstone. *Anduli—Revista Andaluza de Ciencias Sociales*, No. 5, 81-95.
http://institucional.us.es/revistas/anduli/5/art_6.pdf
- Brasil (2012). *Lei nº 12.651, de 25 de maio de 2012*. Dispõe sobre a proteção vegetal nativa [...]. Brasília: Câmara dos Deputados.
- Caetano Nêto, J. (2009). *Dispositivos móveis e estética tecnológica: O espaço e a construção narrativa*. 105 p. Dissertação (Mestrado—Tecnologia da Inteligência e Design Digital), São Paulo: Pontifícia Universidade Católica de São Paulo.
- Caetano Nêto, J. (2011). *O espaço híbrido na construção narrativa*. [São Paulo: ProCoa2011]. Projeto Circuito Outubro aberto, jul. 2011. Veículo #3. R.
<http://www.ohassi.com.br/downloads/veiculoIII.pdf>
- Canclini, N. G. (2006). *Culturas híbridas* (4th ed.). São Paulo: Edusp.
- Carvalho, J. R. P., Vieira, S. R., & Moran, R. C. C. P. (2002). Analysis of Correspondence—A Useful Tool to Interpret Yield Mapping. *The Revista Brasileira de Ciência do Solo*, 26, 435-443. <http://www.scielo.br/pdf/rbcs/v26n2/17.pdf>
- Castro, C. H. S., & Ribeiro, A. E. (2010). Interação para emergência de comunidades virtuais de aprendizagem. *Hipertextus, Revista Digital*, No. 5, 12 p.
<http://www.hipertextus.net/volume5/Carlos-Henrique-De-Castro-&-Ana-Elisa%20Ribeiro.pdf>
- Choo, C. W. (1996). The Knowing Organization: How Organizations Use Information to Construct Meaning, Create Knowledge and Make Decisions. *International Journal of Information Management*, 16, 329-340.
http://ac.els-cdn.com/0268401296000205/1-s2.0-0268401296000205-main.pdf?_tid=e93f3fe6-9b78-11e6-9c17-00000aach35e&acdnat=1477485609_5ee6294e10cd3b37d4062386a1063b4
[https://doi.org/10.1016/0268-4012\(96\)00020-5](https://doi.org/10.1016/0268-4012(96)00020-5)
- Coll, C., Bustos, A., & Engel, A. (2010). As comunidades virtuais de aprendizagem. In C. Coll, & C. Monereo (Eds.), *Psicologia da educação virtual: Aprender e ensinar com as tecnologias da informação e comunicação* (pp. 268-286). Porto Alegre: Artmed.
- Conforto, E. C., Amaral, D. C., & Silva, L. (2011). Roteiro para revisão bibliográfica sistemática: Aplicação no desenvolvimento de produtos e gerenciamento de projetos. In Instituto de Gestão de Desenvolvimento do Produto, *Congresso Brasileiro de Gestão de Desenvolvimento de Produto—CBGDP* (12 p.). Porto Alegre: IBGDP.
- Cunha Jr., M. V. (2000). M. Análise multidimensional de dados categóricos: Aplicação das análises de correspondência em marketing e sua integração com técnicas de análise de dados quantitativos. *Revista de Administração*, 35, 32-50.
- da Silva, S. (2010). Redes sociais digitais e educação. *Revista Illuminart*, No. 5, 36-46.
<https://petbio.icb.ufg.br/up/317/o/volume1numero5artigo4.pdf?1351211156>
- Embrapa (2011). Deliberação nº 23, de 28 de fevereiro de 2011. *Boletim de Comunicações Administrativas*, 37, 61-72.
- Embrapa (2014). *VI Plano diretor da Embrapa: 2014-2034* (28 p.). Brasília: Embrapa.
- Embrapa Agricultural Informatics (2016). *Embrapa Agricultural Informatics— Portal Embrapa*.
<https://www.embrapa.br/group/intranet/embrapa-informatica-agropecuaria>
- Evers, H.-D. (2002). *Towards a Malaysian Knowledge Society*. In *III International Malaysian Studies Conference* (23 p.). Bonn: Center for Development Research.

- Freitas, S., & Neumann, T. (2009). The Use of “Exploratory Learning” for Supporting Immersive Learning in Virtual Environments. *Computers & Education*, 52, 343-352. <https://doi.org/10.1016/j.compedu.2008.09.010>
- Jones, P. M. (2001). *Collaborative Knowledge Management, Social Networks, and Organizational Learning*. https://human-factors.arc.nasa.gov/publications/collab_know_paper.pdf
- Kress, F., & Van Leeuwen, T. (2001). *Multimodal Discourse: The Modes and Media of Contemporary Communication*. London: Edward Arnold.
- Kuhlen, R. (2003). Change of Paradigm in Knowledge Management: Framework for the Collaborative Production and Exchange of Knowledge. In H. C. Hobohm (Eds.), *Word Library and Information Congress: 69th IFLA General Conference and Council* (pp. 21-38). De Gruyter Saur. http://www.kuhlen.name/MATERIALIEN/Vortraege03-Web/rk_ifla03_for_publ300803.pdf
- Lastres, H. M. M. (1994). Acesso à informação: Estratégia para competitividade. *Ciência da Informação*, 23, 287-288. <http://revista.ibict.br/ciinf/article/view/560/0>
- Latour, B. (1994). *Jamais fomos modernos*. São Paulo: Editora 34.
- Lemos, A. (2007). Mídia locativa e território informacional. In P. Arantes, & L. Santaella (Eds.), *Estéticas tecnológicas* (25 p.). São Paulo: PUC-SP.
- Maffesoli, M. (1996). *No fundo das aparências*. Petrópolis: Vozes.
- Martin, F., & Parker, M. A. (2014). Use of Synchronous Virtual Classrooms: Why, Who, and How? *Journal of Online Learning and Teaching*, 10, 192-210. http://jolt.merlot.org/vol10no2/martin_0614.pdf
- Mattar, J. (2011). *Web 2.0 e redes sociais na educação à distância: Cases no Brasil*. La educ@ción Revista digital, (145), mayo. http://www.educoea.org/portal/La_Educacion_Digital/145/studies/EyEP_mattar_ES.pdf
- Mayes, T., & Freitas, S. (2004). *Review of E-Learning Theories, Frameworks and Models* (43 p.). London: Joint Information Systems Committee. <https://goo.gl/sEjJfG>
- Nonaka, I., & Konno, N. (1998). The Concept of “Ba”: Building a Foundation for Knowledge Creation. *California Management Review*, 40, 40-54. <http://home.business.utah.edu/actme/7410/Nonaka%201998.pdf> <https://doi.org/10.2307/41165942>
- Portal Brasil (2012). *Entenda as principais regras do Código Florestal*. Brasília: Presidência da República. <http://www.brasil.gov.br/meio-ambiente/2012/11/entenda-as-principais-regras-do-codigo-florestal>
- Primo, A. (2003). Quão interativo é o hipertexto? Da interface potencial à escrita coletiva. *Fronteiras: Estudos Midiáticos*, 5, 125-142.
- Rebollo-Catalán, A., & Vico-Bosch, A. (2014). El apoyo social percibido como factor de la inclusión digital de las mujeres de entorno rural en las redes sociales virtuales. *Comunicar*, 43, 173-180. <https://doi.org/10.3916/C43-2014-17>
- Recuero, R. C. (2000). *A Internet e a nova revolução na comunicação mundial*. <http://www.raquelrecuero.com/revolucao.htm>
- Santaella, L. (2009). *Matrizes da linguagem e pensamento: Sonora, visual e verbal: Aplicações na hipermídia* (3rd ed.). São Paulo.

- Santaella, L. (2010). *Culturas e artes do pós-humano: Da cultura das mídias à cibercultura* (4th ed., 357 p.). São Paulo: Paulus.
- Santaella, L. (2011a). *Linguagens líquidas na era da mobilidade* (2nd ed., 468 p.). São Paulo: Paulus. (Comunicação)
- Santaella, L. (2011b). *Navegar no ciberespaço: O perfil cognitivo do leitor imersivo* (4th ed., 191 p.). São Paulo: Paulus.
- Santaella, L., & Lemos, R. (2010). *Redes sociais digitais: A cognição conectiva do twitter* (137 p.). São Paulo: Paulus. (Comunicação)
- Santos, M. (1980). *Por uma geografia nova: Da crítica da geografia a uma geografia crítica*. São Paulo: Hucitec.
- SAS Institute Inc. (2008). *SAS/STAT 9.2 users's guide*. Cary, NC: SAS Institute Inc.
- Sheller, M., & Urry, J. (2006). *Mobile Technologies and the City*. London: Routledge.
- Spagnoletti, P., Resca, A., & Lee, G. (2015). A Design Theory for Digital Platforms Supporting Online Communities: A Multiple Case Study. *Journal Information Technology*, 30, 364-380. <https://doi.org/10.1057/jit.2014.37>
- Tönnies, F. (1955). *Community and Association: (Gemeinschaft und Gesellschaft)*. London: Routledge & Kegan Paul.
- Torres, T. Z., & Amaral, S. F. (2011). Aprendizagem colaborativa e web 2.0: Proposta de modelo de organização de conteúdos interativos. *ETD—Educação Temática Digital*, 12, 49-72. <http://www.brapci.ufpr.br/brapci/index.php/article/download/16094>
- Torres, T. Z., Souza, M. I. F., Carvalho, J. R. P., & Evangelista, S. R. M. (2015). Multimedia Design and Transmedia Storytelling: Content Production for Microtrainings. *Creative Education*, 6, 2466-2480. <https://doi.org/10.4236/ce.2015.623254>



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5th - 7th Grade Girls' Conceptions of Creativity: Implications for STEAM Education

Blakely K. Tsurusaki¹, Carrie Tzou¹, Laura D. Carsten Conner², Mareca Guthrie³

¹School of Educational Studies, University of Washington Bothell, Bothell, WA, USA

²College of Natural Science and Mathematics & Geophysical Institute, University of Alaska Fairbanks, Fairbanks, AK, USA

³College of Liberal Arts & UA Museum of the North, University of Alaska Fairbanks, Fairbanks, AK, USA

Email: btsuru@uw.edu

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Abstract

Creativity is at the heart of both art and science, yet art is commonly viewed as more creative than science. A STEAM (science, technology, engineering, art, and math) approach to education has the potential to increase understandings about creative practices and dispositions that are common to both fields. In this paper, we examine how 5th - 7th grade girls attending a summer STEAM academy viewed creativity in both art and science. We draw on existing concepts of creativity, with a focus on the 4P framework (person, press, process, product) (Rhodes, 1961), to frame and explain similarities and differences in the girls' notions of creativity. We found a number of similarities in views about creativity in art and science, as well as some important differences: Girls view creativity as it relates to art as associated with the person, while they more often view creativity as it relates to science as associated with specific practices or processes. Further, the girls viewed art, and creativity in art, as essentially an unstructured enterprise with no rules. We discuss the implications for STEAM instruction that can help support the development of authentic views of creativity in art and science, which in turn may foster interest and engagement with both fields.

Keywords

STEAM Education, Creativity, 4Ps, 4Cs, Art, Science

1. Introduction

Integrating art with STEM, or STEAM (Science, Technology, Engineering, Art, and Math), has gained tremendous popularity over the last several years, in large part due to the assumption that this approach positively impacts a suite of outcomes associated with science learning. While STEAM as a research field is still

young, there is emerging evidence for significant impacts on youth. For instance, the maker movement, in which learners design STEAM products such as Arduino-based textiles, music produced through circuit blending, or sculptures produced by 3-D printers, has yielded evidence of deepened engagement in STEM practices (Brahms, 2014). It has also been shown to increase the development of interest, identity, and STEM content knowledge (Vossoughi & Bevan, 2014) and to promote design thinking (Peppler, 2013; Norris, 2014).

STEAM education is premised on the idea that there are deep overlaps between the practices of art and science, and these overlaps represent an opportunity to show the “trans-disciplinary” (Root-Bernstein, 2003) nature of thinking—especially of creative thinking—that can occur when one thinks across disciplines rather than within single disciplines. Art and science share many overlaps in terms of both common practices and habits of mind. Visual-spatial thinking is key to understanding the structure of molecules, the actions of enzymes, and the 3-D structure of galaxies (Ramadas, 2009). Visual-spatial thinking is heavily used to model abstract scientific concepts (Walker et al., 2011) and is also widely recognized as a central aspect of creating art (Kozbelt, 1991). Artists form mental images of space, line, color, and shape before committing these images to paper or other mediums (Walker et al., 2011), and they excel at visual-spatial tasks such as mental rotation, visual analysis, and form recognition (Kozbelt & Seeley, 2007). Experimentation also takes place across both the sciences and art—scientists form hypotheses, record results, and communicate those results to the public. Similarly, artists experiment with mixing colors, various painting or sculpting techniques, and publicly show their work in galleries or art shows. Fulton & Simpson-Steele (2016) outlined practices common to both science and art, such as noticing, wondering, visualizing, and communicating. Both the *Next Generation Science Standards* (NGSS) (NGSS Lead States, 2013) and *The National Coalition for Core Arts Standards* (NCCAS) (NAEA, 2013) also outline major practices that are inherent dimensions of each discipline, such as investigation, experimentation, and observation.

Creativity is also at the heart of both art and science. In fact, Root-Bernstein (2003) argues that “the ways in which artists and scientists discover and invent problems, experiment with ways to come to grips with them, and generate and test possible solutions is universal” (p. 268). However, despite the momentum of STEAM education efforts, science is still seen largely as rigid and dispassionate, while art is seen as more creative (Mishra et al., 2012; Henriksen, 2014). The question then arises of how we can utilize innovations such as STEAM to encourage perceptions of creativity across disciplines that reflect the authentic practices of each.

In this paper, we examine how 5th - 7th grade girls attending a summer STEAM academy viewed creativity in both art and science. We ask the following questions: (1) what views of creativity do the girls have, and how do they differ between art and science? (2) what do their views of creativity in art and science tell us about their understandings of the disciplines? and (3) based on these findings,

what are implications for teaching about creativity in both art and science in order to support trans-disciplinary learning across art and STEM?

In what follows, we first frame our work with a review of conceptions of creativity that we draw on and how we operationalize creativity using the four P framework (Rhodes, 1961). Then, we share the results from two years of data, 2015 and 2016, of 5th - 7th grade girls' conceptions of creativity as they relate to the four P framework and the similarities and differences in how girls described person, process, product, and press across art and science. We document the range of ideas that girls have around creativity as it relates to the four Ps and to art and science. In the discussion, we examine themes that point to differences that girls see in creativity when specifically linked to art or science, and in turn, larger issues about how the girls view art and science as domains. Finally, we discuss the implication of this work for STEAM instruction.

2. Framing Creativity

2.1. Conceptions of Creativity

Creativity is a difficult concept to define and has been studied from individualistic or personalities perspectives, cognitive perspectives, and sociocultural perspectives (Sawyer, 2012). As there are many conceptions of creativity, we provide a review of common conceptions of creativity that we use to guide our work. A common framework for conceptualizing creativity is the idea of big C and little c creativity. In big C creativity, creativity is the generation of a product that is judged to be novel and also to be appropriate, useful, or valuable by a suitably knowledgeable social group (Sawyer, 2012). It is reserved for significant historical achievements, such as those made by recipients of prestigious awards such as the Nobel Prize, National Medal of Science, Pulitzer Prize or other top awards and accolades in their respective domains. According to Csikszentmihalyi (1997):

Creativity is any act, idea, or product that changes an existing domain, or that transforms an existing domain into a new one. And the definition of a creative person is: someone whose thoughts or actions change a domain, or establish a new domain. It is important to remember, however, that a domain cannot be changed without the explicit or implicit consent of a field responsible for it. (p. 28)

Csikszentmihalyi emphasizes that creativity is observed in the interrelations of a three-part system that includes the domain, field, and person. The domain, such as science or art, consists of a set of symbolic rules and procedures. The field includes the individuals, who in visual arts include curators, art critics, art teachers and others, who act as gatekeepers and decide whether a new idea or product should be included in the domain. It is the person, the third part of the system, who uses the symbols and procedures to produce something that is deemed creative by her/his field. Studies of big C creativity tend to focus on creative people, their work and how they have been creative through moving a domain forward in new and different ways (e.g., Csikszentmihalyi, 1997; Simonton,

1994; Gardner, 1993).

While big C creativity is associated with famous, well-known people, little c creativity can be found in most people (Kaufman & Beghetto, 2009). Little c creativity, often referred to as everyday creativity (Sawyer, 2012; Beghetto & Kaufman, 2007), is associated with creativity that takes place during routine activities that people perform in their daily lives, such as when a person comes up with a new cooking recipe or a variation on a piece of music. Theories and research that focus on little c creativity investigate how people use creativity and its importance in daily life, and how creativity is not relegated to a few individuals within society, but rather widely distributed (Kaufman & Beghetto, 2009).

While big C and little c creativity are two conceptions of creativity, Beghetto and Kaufman introduce “mini-c” and “pro-c”¹ creativity to capture other instances of creativity not embodied by big or little c (Beghetto & Kaufman, 2007; Kaufman & Beghetto, 2009). Beghetto and Kaufman “...define mini-c creativity as the novel and personally meaningful interpretation of experiences, actions, and events.” (Beghetto & Kaufman, 2007: p. 73). Unlike big C and little c creativity, which rely on external validation, mini c creativity is an interpersonal judgment. It highlights how creativity plays a role in the learning process. Mini c is useful for considering, for example, the creativity of students and how teachers can foster creativity, and allows for personal creativity or learning of something novel that others may already know or understand. Furthermore, because mini c relies on intrapersonal learning, it broadens conceptions of creativity that may only recognize external products.

Indeed, as Vygotsky (1967/2004) noted nearly half a century ago, “any human act that gives rise to something new is referred to as a creative act, regardless of whether what is created is a physical object *or some mental or emotional construct that lives within the person who created it and is known only to him*” (emphasis added) (As cited in Kaufman & Beghetto, 2009: p. 4)

Mini c accounts for creative potential and processes rather than examining or placing too much emphasis on outcomes, as little and big C do.

Mini c fills a gap in the creativity framework for understanding the role that processes and intrapersonal learning play. However, big C, little c and mini c do not account for individuals who are professionals, but have not yet reached the status of big C by contributing revolutionary products to their field. Pro c fills this gap by providing for a professional level of expertise in a creative area. It presents those who have moved beyond little c, but have yet to obtain, or perhaps may never obtain, big C status. Pro c requires training, production of a product (e.g., book, painting, invention), and is externally validated and domain specific. See **Table 1** for a summary of big C, pro c, little c, and mini c conceptions of creativity.

¹Beghetto and Kaufman (2007) use hyphens as they name the 4cs: “mini-c”, “little-c”, “pro-c”, and “big-c”, but this notation is unique in our searches of the literature. For clarity, we will not use the hyphen as we describe the 4Cs.

Table 1. 4 Cs of creativity.

Conception of creativity	Description	Domain specific	Product that is externally validated
big C	Very few people and/or products considered big C creative; reserved for those who make historical achievements	Yes	Yes
pro c	Professional level of expertise in a creative area; requires training	Yes	Yes
little c	Everyday creativity found in most people	Usually	Yes
mini c	Personally meaningful creativity; highlights the role that process plays in creativity	Not required	Not required

2.2. 4 Ps: A Way to Operationalize the 4Cs

Closely related to the 4 C framework is the 4 P framework (Rhodes, 1961). Csikszentmihalyi (1997) emphasizes that creativity involves a three-part system including the domain, field, and person, all of which are key features of big C creativity. However, domain changes are not associated with mini c or little c creativity. The 4 P framework operationalizes elements of creativity through a focus on product, person, process and press. Product refers to products (inventions, new drug treatments, original pieces of art) that are judged novel and appropriate by the field. Person refers to personality traits or types associated with creativity. Process involves the processes during creative work or creative thought and press refers to the environment or context “acting on the creative person or process, such as the social and cultural context.” (Sawyer, 2012: p. 11). In our work, we focus on perspectives of creativity that take into account interactions between press, person, process and product. Big C, pro c, and little c all emphasize products that are created by people, while mini c recognizes creative processes of people, or learning that may be new to the person but not new to the domain or field. Rhodes (1961) argues that “what is happening here is that a word which should be reserved to name a complex, multifaceted phenomenon is misused to name only one part of a phenomenon...But creativity cannot be explained alone in terms of the emotional component of the process or in terms of any other single component” (p. 306). Thus, creativity works as a complex system where each of the Ps interacts with the other and “overlap and intertwine” (p. 307). This study leverages the 4 P framework as a tool to classify and examine girls’ beliefs and ideas about creativity as it relates to art and science. In contrast to descriptions of creativity that draw from experiences and reflections of notable creative minds (c.f., Root-Bernstein, 2003; Csikszentmihalyi, 1997), this study draws from empirical interview findings of over 100 5th - 7th grade girls to provide a rich description of how they view creativity in art and science. Thus, we add a data-driven perspective to documenting how views of creativity relate to views of the disciplines of art and science, and what that can tell us about designing learning environments that support trans-disciplinary learning.

3. Methods

3.1. Context

The context for this study is a two-week summer academy for 5th-7th grade girls called *The Colors of Nature*. Data for this study were collected in the summers of 2015 and 2016. The academy ran for two sessions for two weeks each, once in a large urban city in the Southwestern United States and once in a small city in the far Northwestern United States. The focus of the academy was “the colors of nature”, focusing on the function of color in biology (that is, the reason why the color evolved) and its overlap with art, how color is produced (optical science and its overlap with art), and how the practices of science overlap with the practices of art (observation, experimentation, recording procedures, taking notes, analysis, publicly presenting scientific/artistic results).

The academy was designed around a series of design challenges, purposefully designed to integrate science content and practices with art projects and practices. For example, after learning about the various reasons that organisms have evolved colors (camouflage, mating, startle, etc.), the girls planned out and designed a stop-motion animation video where they chose one function of color and depicted it in some way in their video.

Researchers assumed the role of participant-observers, sometimes interacting with youth during activities, conducting interviews with participants, videotaping sessions, and taking field notes. Data sources for this study include interviews and art/science attitude surveys. Each participating girl was individually interviewed by one of the researchers. The interviews were audio-recorded, transcribed and analyzed. The paper surveys were completed by each girl at the beginning of the academy and then transcribed and analyzed.

3.2. Coding

After coding each interview across the two academies for two summers ($n = 120$), we analyzed the utterances that were coded for both science and at least one of the 4 Ps to look for patterns in how the girls described creativity in the context of scientists and their work. We then did the same analysis looking at utterances that were coded for both art and at least one 4 P code. We also analyzed survey data ($n = 116$), where the girls were asked to describe characteristics of scientists and artists. We examined how often girls described scientists and artists as creative in the surveys. While we draw on the survey data to show differences in how often girls ascribe creativity to scientists or artists (Person), in the following sections, we present findings that illustrate the range of ways that girls perceived creativity in art and science, and the insights that these perceptions of creativity gave us into the girls' views of the nature of the disciplines of art and science. We argue that this contributes unique descriptions of perceptions of creativity that serve to operationalize the 4 Cs in terms of the 4 Ps.

4. Results

In this section, we will present results from the interviews and art/science sur-

veys in order to provide a rich description of how the girls view creativity in art and science. We organize this section around the 4 Ps and then analyze the findings in the following section.

4.1. Person

Girls often described creativity as a trait, or associated with a person. One girl described creativity as, “Where you have a good mind and you’re good at making things and you are very creative. You have good ideas about different things and you do it and it’s creative.” Creativity is part of who a person is; it is part of their mind.

Girls completed surveys that included open-ended questions asking them to list four descriptors of scientists and artists. **Table 2** shows the percent of responses from the 2015 and 2016 surveys that included “creative” in one of the four slots for either scientists or artists.

Only 17.24% of the girls listed “creative” as an attribute of scientists, while 54.31% listed it as an attribute of artists. The girls were also asked to describe artists and scientists in their interviews. When girls talked about creativity as a trait, they typically said it was something that an artist or person had. For example, when one girl was asked to describe an artist, she said, “An artist is creative, helpful, energetic, creative.” Similarly for science, a girl described a scientist as, “They’re smart. They’re creative. They’re problem solving...” The girls listed creativity as a trait, similar to other traits such as being smart, kind or fun. They talked about creativity as a trait of a person in general terms, which suggests that this trait could be found in a person at the mini c, little c, pro c or big C creativity. Sometimes the girls mentioned a specific artist or scientist and described her/him as creative. For example, one girl, when asked to describe a scientist, said:

Interviewee: I always think of Bill Nye.

Interviewer: Bill Nye the Science Guy, okay.

Interviewee: Because he’s like fun, creative... and he shows how to do science in different ways, like he’ll give one example the way he would do it and then he would have someone else—like he would do it the way someone else would do it like a kid would do it just to be fun.

Bill Nye hosted a television show in the United States called, *Bill Nye the Science Guy*, and his creativity may be considered by the field as pro c creativity. Girls also mentioned scientists such as Einstein and artists such as Van Gogh and Picasso, who would be judged by their respective fields as having big C creativity, as they moved their respective domains forward in meaningful ways.

Table 2. Girls’ association of creativity with scientists and artists, 2015 and 2016 results combined.

	% responses (n = 116)
Scientists	17.24
Artists	54.31

While the girls mentioned creativity with relation to artists and scientists, they did not expand upon the trait.

4.2. Process

We defined process as actions that artists and scientists engage in during creative activity. Rhodes (1961), when originally conceiving of the 4 Ps, imagined process to involve “motivation, perception, learning, thinking, and communicating” (p. 308). These were the processes in which “inspiration” occurred, as well as the processes by which one “convert[s] an idea into an object or into an articulated form” (p. 308). We divided processes into specific actions, including innovate, discover, construct, and experiment. While the girls discussed practices such as “experiment” and “discover” in other contexts during the interview, process codes were only used when specifically in the context of discussing creativity.

When girls used the word “innovate”, they referred to practices where an artist or scientist improved upon a pre-existing method. For example, one girl said, “let’s say they [scientists] have a really hard question or science problem they’re trying to solve and they don’t know the answer to it. So, they use other scientists’ method and then they turn it into their own method.” Similarly, another girl said, “I think that even though they’re scientists and they’re working really hard to like create the future basically, they’re also doing things creatively, like thinking like how can I make this better?” In these examples, scientists are seen as using creativity to take existing methods or situations and iterating on them to make them their own or improve them. Innovate in art was seen similarly, when girls discussed taking existing lines or shapes and making them into something new: “they can turn a line into something else creative like a unicorn.”

Discover was a process that was never coded for artists. For scientists, the girls mentioned that scientists needed creativity to think differently in order to make discoveries: “if they [scientists] were to go out and then discover—try to discover something new, they would have to think in their mind and be creative of what they might discover. Another girl said, “They have to think differently. To find out something new, they have to be thinking different than everyone else.” We think it is interesting that discovery was not reported as a part of the creative process for the girls, even in the context of mini c, or personal discovery of new art techniques or mediums, especially as our observations of the girls during the academy were not consistent with this view. We documented moments of mini c-related discovery: of how ink would fall in water, how pigments affected each other, and of certain properties of materials for projects. We think this was more to do with the language of “discovery” usually being more connected with processes in science than with art, but this also gives us insight into how disciplines can be viewed differently despite significant overlaps in practice.

Construct was coded when the girls described the process of using creativity to build something. For example, one girl said of artists, “I think that when you make something new and it’s never been done before or it’s just something that popped up in your head, and I think that’s the most creative part of doing art.”

Another girl said of scientists, “They’re creative and problem solvers. They have to think a lot and think of new ways to do things to make something happen or to fix something or to make something new.” In both of these cases, scientists and artists use creativity to make something completely new.

Experiment was coded when the girls described the processes of testing or experimenting in either art or science. One girl said of scientists, “they have to like create what they’re gonna be experimenting, so they have to have an idea of what they’re gonna be doing, and so they have to be creative to figure out what they want to find out. Similarly, another girl said of scientists, “They test things out and they experiment with different things, like maybe they use chemicals to figure out a new type of medicine that can cure a sickness a disease, yeah, like test things out.” Of artists, one girl said, “They need to like experiment with different colors and mixing them.” In all of these examples, creativity is used in the process of either coming up with an experiment or in the experimenting itself.

In both science and art, the girls mentioned that creativity can be used to solve problems. This view of the role of creativity in science and art closely reflects the engineering practices in the *Next Generation Science Standards* (NGSS lead states, 2013) that focus on defining problems and coming up with solutions to those problems. In fact, the engineering design process (Jenkins, 2015) reflects very similar practices outlined in the national visual arts standards (NAEA, 2013). Both articulate processes of brainstorming multiple solutions or approaches to a problem or creating a work of art, researching constraints on a problem or with materials, and presenting or communicating about your solution or piece of art. Examples from the girls included:

Art

- If you didn’t have equipment to answer your question, you would be creative and find another way.
- They [artists] have to be creative, like, if—also if something doesn’t go right. Like, they accidentally mess up, you have to be creative to fix it. You know, like, just pretending it’s something else.

Science

- They [scientists] have to be creative, like if something doesn’t go right they have to be creative and find a new strategy and find a new way.
- If something doesn’t go right they have to be creative and find a new strategy and find a new way.

4.3. Product

According to a big C, pro c, and little c definitions of creativity, there needs to be some type of product that can be judged by an appropriate community as creative. Similarly, girls described creativity as associated with a product, saying, “I would say that creativity is just kind of like making unique things that haven’t really been done before...” and “Creativity is something that you make and someone call it creative, it will be—say, if you made this tablet, a person who made this tablet is creative. Creativity. That’s creativity.” While some girls asso-

ciate creativity with products, some go further in their descriptions, explaining that the products are unique, different, or new from what has been done before.

When specifically talking about art and creativity, the girls mentioned products, such as pieces of artwork, when they discussed creativity. For example, one girl said:

There are sculptures and thinking of stuff that's different. For you to make money, you can't just draw something that's boring and is like a painting that's white with no creativity. No one would buy it because it's just white. It's just dull. If it is really different and cool, I feel like you'd get more sellers because it's more creative and different. People like different, I think.

She associated creativity with a product that one might buy. She also explained that a product is creative when it is different. Similarly, another girl talked about how artists are creative because they are creating a product that is new or different. "Yes, artists do almost all of the time, unless they're recreating a piece exactly. But, I think that when you make something new and it's never been done before or it's just something that popped up in your head, and I think that's the most creative part of doing art." One girl described the importance of art as fostering creativity:

Well, I found out art is getting cut, and I was like, What!? 'cause seriously! I think if children, if they spent more time and money, if they spent more of the budget it into music and art, then children would discover that creativity, and they can invent more stuff.

Even as she argued for the importance of art in schools, she talks about creativity as leading to a product. She said that "they can invent more stuff."

Just as they talked about creativity in terms of products in relation to art, they also talked about products in terms of science. One girl said, "they have to be creative to think of new things that they need to figure out and stuff like that," while another stated, "Because scientists use different tools and stuff and they might put two tools together to make a different tool." Yet another girl associated creativity with coming up with a new medicine, explaining, "Well, I guess because if they're like mixing—like if they're like making a different kind of medicine they'd have to be creative to create to help defeat the sickness that you have." Scientists create "new things", tools, medicine or other products. Some girls associated the products with things that would help people, such as medicines or tools.

New ideas: While some products were physical, products were sometimes described as new ideas. For example, one girl talked about creativity as, "being able to come up with your own unique ideas." When specifically talking about art, one girl described her own creativity as, in part, the ability to come up with ideas. She explained that she likes art because:

It's just a good old way to express me and how—like, my mom always says how I'm creative and sometimes I don't—when I can't think of ideas it fru-

strates me, but then I just keep going and I eventually have an idea. Like I just do the first thing that comes to my mind and try it out and if I don't like that I brainstorm more ideas.

To her, an important aspect of creativity was the ability to come up with ideas. Similarly, in science, one girl said, "Yeah, you can't come up with new ideas if you're not creative. I mean, if you're not creative, then maybe we wouldn't have plastic or this couch, or maybe we wouldn't even have windows." Another girl stated, "Yes, because they have to, like, think of what they wanna do and then they have an idea and then it can be a really creative idea." While a new idea may be considered a creative product in itself, it is also part of the process, the starting point, to making a creative product. One girl explained that she liked doing science because, "I get excited testing new things to develop. New ideas. Just be creative and thinking about new ideas to develop new things. Like how the ice cream was made or the microwave." In other words, creative, new ideas, lead to the development of new products. Products are an essential feature of big C, pro c and little c conceptions of creativity, and can play a role in mini c creativity. Products—whether they be tangible and concrete, or the application of new techniques or styles—are necessary, as they are the aspect that is deemed creative by the field.

4.4. Press

Press can be viewed as the context or environment in which creativity takes place (Sawyer, 2012). One example of press we found was when a girl described her relationship with her sister.

Interviewee: I think my sister is a scientist because she is really creative every day because every day when I come home she tells me do you want to do arts and crafts, or do you want to help me or I could help you design your room more and I said okay and she just is really creative because she really likes helping other people do other things and sometimes she gets angry because sometimes she doesn't have the equipment or something, but if she doesn't have the equipment, she gets unmad because she goes to the store and buy new things with her own money.

Interviewer: So what types of things do you do?

Interviewee: We paint, she helped me paint my room, just me and her and she helped me put stickers and paint horses in my room. And she like baked the candle holder for me because I lost my other one and she made a new candle holder for me and she designs like she plants flowers and she puts them in a vase and gives them to me and we paint them. And we paint pots and pans and stuff.

We include this as an example of press because she describes a creative environment, where her sister helps provide the tools and encouragement for her to be creative. Her sister asked her if she wanted to do arts and crafts or design her room, which the girl deemed as things a creative person, such as her sister,

would do. She also talked about the tools necessary to be able to do creative work, which are part of the environment, or press. Because we view press as the context within which the person conducts creative processes, and often, products, it can be conceptualized as encompassing of Csikszentmihalyi's (1997) three-part system of domain, field, and person. These parts interact and have different rules for judging something as novel and important, depending on whether one is using big C, pro c, little c or mini c as a framework for creativity. In this example, the girl describes how her press fosters mini or little c creativity. This underscores the value of emphasizing conceptions of creativity beyond big C when working with youth. Providing a social and environmental context that encourages open ended exploration and the chance to be influenced by other's work could be instrumental in this effort.

5. Discussion: Interrelationships between Person, Process, Product and Press

While we found many similarities in how girls described person, process, product and press across art and science, we also discovered two themes that point to differences that girls see in creativity when specifically linked to art or science, and to larger issues about how the girls view art and science as domains. These themes not only show the differences, but also the relationships and interactions between the four Ps.

5.1. Theme 1: Artists and Art Are Inherently Creative, While Science Is Sometimes a Creative Process

We found that the girls often thought that artists and art were inherently creative as people and as a discipline while scientists are creative when engaged in specific practices. When asked whether artists use creativity in their work, many girls described creativity as an inherent dimension of being an artist or of art itself. For example, one girl said, "Creativity is kind of what an artist is. An artist needs to be creative because, like, take the guy who made the melting clocks one, that took a lot of creativity to do the melting clocks, the melting time." In this example, we see creativity being equated with Salvador Dalí's work (1931), or what Kaufman and Beghetto (2009) call big C, "clear-cut, eminent creative contributions" (p. 2). Similar examples included: "you have to pretty much be creative to do different kinds of art", and "drawing and painting are creativity". This view of creativity attributes creativity to the entire enterprise and person because of inherent traits or qualities of the discipline or person.

When asked whether scientists use creativity in their work, many of the girls equated creativity in science to specific practices, such as asking questions, experimenting, or "mixing" substances together. Examples included:

- They [scientists] have to like first of all, think of what they want to figure out and then create a way to figure it out.
- Sometimes, you just have to go for it. Test things out: be creative on how to test them. And then later, see "Oh, this failed. We should try it this way".

And so, that really helps at the beginning of their science projects.

- Scientists are creative by coming up with theories on how something might work and then trying to figure it out.
- Sometimes scientists can use an invention that's already made and then they can evolve it.

In this view of creative process related to science, creativity is in the practices of science. In the above examples, practices include “test[ing] things out”, “coming up with theories”, being creative in how scientists “use an invention that's already made” and “evolv[ing] it”. This corresponds to Kaufman and Beghetto's (2009) little c level of creativity in that it involves “domain-relevant skills” that “include knowledge, technical skills, and specialized talent” (p. 3). In this view, creative process is tied not to scientists themselves or science as a discipline, but rather to specific practices that they might engage in. This way of thinking about creativity ties to specific scientific practices within the *Next Generation Science Standards* (NGSS Lead States, 2013), such as asking question/designing problems and planning and carrying out investigations.

5.2. Theme 2: Creativity Is Unstructured

Our findings indicate that the girls thought that in art, creativity means that there are no rules, because art is not structured; in science, creativity exists where there is fun and no structure. As more structure or “rules” apply, less creativity is used. The girls saw creativity in art processes stemming partly from their perception of art as having no structure or rules. Examples from this view included:

I think they [artists] use creativity in their work a lot 'cause there's no rules in art.

It's just fun to just get creative with it [art] and just do whatever you want.

Whoever wants to be creative and wants to just mess around with art, see what they can make, 'cause I just like do random marks until I—like something pops in my head without me even knowing and I just do that.

This view of creativity in art can be linked to the concept of mini c (Kaufman & Beghetto, 2009), in that it reflects an understanding of “personal creativity” (p. 3), or “everyday expressions of creativity” (p. 4) that are involved in personal creation of art. However, it also reflects an understanding of artistic process itself as being non-systematic and without “rules”. There is a sense that anything goes in art, and that, related to Theme 1, because art is inherently creative, any processes involved in the creation of art must therefore also be creative. This understanding of creativity and art masks the systematic nature of artistic practice itself and of cognitive practices that occur tacitly in an individual's creative process (Rhodes, 1961). *The National Coalition for Core Arts Standards* (NAEA, 2013) call out the systematic research and preparation that goes into creating a piece of art, as well as practices such as evaluating and interpreting art.

In contrast, the girls' perceptions of science involved more structure and

“facts”—and as these increase in the course of a scientific investigation, less creativity is used.

Interviewee: I think [science] is fun and creative in some ways.

Interviewer: Why is it creative?

Interviewee: Science is creative because you start out with your own ideas, you start out with what you think is right. And further into it, you get more serious and you think, “oh, this is wrong. I have to find something else for it”. Do research and then you—then it gets less creative. But at the beginning, it’s very creative.

Interviewer: Why do you say it gets less creative?

Interviewee: Every project I’ve done, it gets more serious and—all on the facts... So, if you have science project you’re working on and you think, “Oh, this will be a cool idea!” And then you try it. If it doesn’t work, you keep trying. It’s all based on your ideas. And then, you stick to the facts of what happens. Like, I was doing a project with my class and we were trying to figure out if we should do like, using gravity or things like that for this car thing. And so, we had to find out what worked. And I think that was just more like a creative experience. And then, the more we tried, the more stuck to the facts we were.

In this example, we see a similar view as with art—that scientific processes start out as a “creative experience” when there is less structure and “it’s all based on your ideas”. As the process proceeds, however, it gets less creative as one gets more “stuck to the facts”. This reflects a common understanding of scientific processes as rigid and prescribed (Schwab, 1962), rather than emerging through a creative process.

In fact, there was the sense that because scientists have to do their work accurately, this was in tension with using creativity. Some examples were:

They [scientists] usually have to kind of accurately—try to accurately figure it out, but they can still use creativity to do something with it, I guess—kind of—maybe not all the time but sometimes, yeah.

Interviewer: Do you think scientists use creativity in their work?

Interviewee: I’m going to go with no because if they’re trying to draw something they can’t use their creativity because they’re science and they have to draw the exact thing otherwise if you’re discovering a new species and you sketch if you can’t really use creativity.

These examples reflect the understanding that in science, there is a need to convey or discover accurate information and therefore there is no room for creativity. This is similar to a positivist view of science (c.f., Laudan, 1996; Harding, 1991) that argues for a knowable, objective “truth” in the world, and the scientist’s job is to discover or represent that truth. In this view, the scientist’s own viewpoints, biases, and cultural backgrounds are irrelevant in scientific processes because findings represent objective, universal truths about the world.

More contemporary views of the nature of science (Harding, 1991) argue that scientific processes are a dynamic interaction between scientific expertise, technology, cultural climate, and consensus building within a scientific community.

When taken together, these contrasting views of art (as creative and unstructured) and science (as rigid and less creative) reflect views of the disciplines that do not include more nuanced views of complex practices within each. This represents an opportunity for how a STEAM approach could highlight the overlap in practices between the different STEM disciplines and art, and the role of creativity in each.

6. Implications

Science and art are often viewed as very different from one another, with science representing rationality and logical reasoning while art is seen primarily as aesthetic; thus, creativity is more often associated with art than science (Kind & Kind, 2007). Surveys of student and public perception of science indicate a lack of awareness or appreciation of science as a creative endeavour (Schmidt, 2011). However, there is increasing interest in the overlap between not only art and science, but art and technology, engineering and math, as a way to increase interest, engagement, and learning in STEM.

However, our data suggest that even when art is considered creative in its very nature, seldom were any specific artistic practices described in relation to creativity in art. This begs the question of how we can encourage thinking about creativity within the larger context of art practices. How narrowly or broadly youth conceive of a discipline has implications for how they can identify with that discipline. Conversely, our data suggest implications for the teaching of science as well, given the view that the girls had that while science may start out with creative ideas, the structure involved in scientific investigations lacks creativity. Schmidt (2011) argues:

A recent review of perspectives and challenges in science education indicates that a belief that there is, and can only ever be, one valid, scientific “way of knowing” is widespread; that the root cause is a lack of alignment between science education/educators and scientific practice. (p. 440)

Coming to understand that creativity can exist in science at different levels of scientific investigation—from applying new measurement techniques to how data are represented—can support an understanding of multiple ways of knowing in science. Supporting students in seeing the overlaps in practices between art and science can be a way to resist “traditional models of teaching and learning have done much to cultivate perceptions of science as a non-creative endeavour” (Schmidt, 2011: p. 411). In fact, Schmidt goes on to argue that “Overt emphasis on rote-learning and rigid, dogmatic adherence to rules of the discipline are not only deterrents for students... they are fundamentally incompatible with the true nature of science” (p. 441).

This suggests, then, that teaching through a STEAM approach, which encou-

rages deep connections between STEM and art disciplines, has the potential to illustrate the creative face of science through highlighting its overlap with art, which is typically seen as creative. In our approach to STEAM education, students engage with scientific ideas—such as the function of color in nature or polarization of light—through the creation of original pieces of art. Our work also holds implications with respect to both domain-specific teaching and trans-disciplinary teaching and learning. Schmidt (2011) argues that science education must support creativity by providing opportunities for students to acquire a high level of domain specific knowledge, practice application of knowledge as they develop solutions to problems, and link their knowledge of science to their knowledge of other fields as required to pursue and solve problems of relevance/interest to them. While understanding domain knowledge is important, we emphasize the importance of providing experiences where the overlap in domains, particularly practices, may help engage and interest students in science. This study suggests that more work needs to be done to determine similarities and differences in creativity in art and science and how they can be developed in complementary and intersecting ways to engage students in science. Further work must also be done to investigate how this impacts art- and science-related interest and engagement, as work in STEAM thus far has shown promise and should continue to be investigated.

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References

- Beghetto, R. A., & Kaufman, J. C. (2007). Toward a Broader Conception of Creativity: A Case for “Mini-C” Creativity. *Psychology of Aesthetics, Creativity, and the Arts*, 1, 73-79. <https://doi.org/10.1037/1931-3896.1.2.73>
- Brahms, L. J. (2014). *Making as a Learning Process: Identifying and Supporting Family Learning in Informal Settings* (Doctoral Dissertation). Pittsburgh, PA: University of Pittsburgh.
- Csikszentmihalyi, M. (1997). *Creativity: The Psychology of Discovery and Invention*. New York, NY: Harper Perennial.
- Dalí, S. (1931). *The Persistence of Memory*.
- Fulton, L. A., & Simpson-Steele, J. (2016). Reconciling the Divide: Common Processes in Science and Arts Education. *The STEAM Journal*, 2, 3. <https://doi.org/10.5642/steam.20160202.03>
- Gardner, H. (1993). *Creating Minds*. New York, NY: Basic Books.
- Harding, S. G. (1991). *Whose Science? Whose Knowledge? Thinking from Women's Lives*. Ithaca, NY: Cornell University Press.
- Henriksen, D. (2014). Full STEAM Ahead: Creativity in Excellent STEM Teaching Prac-

- tices. *The STEAM Journal*, 1, 15. <https://doi.org/10.5642/steam.20140102.15>
- Jenkins, T. (2015). *Bringing Engineering Design to the Classroom*. <https://www.teachingchannel.org/blog/2015/12/11/engineering-design/>
- Kaufman, J. C., & Beghetto, R. A. (2009). Beyond Big and Little: The Four C Model of Creativity. *Review of General Psychology*, 13, 1-12. <https://doi.org/10.1037/a0013688>
- Kind, P. M., & Kind, V. (2007). Creativity in Science Education: Perspectives and Challenges for Developing School Science. *Studies in Science Education*, 43, 1-37. <https://doi.org/10.1080/03057260708560225>
- Kozbelt, A. (1991). Artists as Experts in Visual Cognition. *Visual Cognition*, 8, 705-723.
- Kozbelt, A., & Seeley, W. P. (2007). Integrating Art Historical, Psychological, and Neuroscientific Explanations of Artists' Advantages in Drawing. *Psychology of Aesthetics, Creativity, and the Arts*, 1, 80-90. <https://doi.org/10.1037/1931-3896.1.2.80>
- Laudan, L. (1996). *Beyond Positivism and Relativism: Theory, Method, and Evidence*. Boulder, CO: Westview Press.
- Mishra, P., & Henriksen, D. (2012). Rethinking Technology & Creativity in the 21st Century: On Being In-Disciplined. *TechTrends*, 56, 18-21. <https://doi.org/10.1007/s11528-012-0608-y>
- National Art Education Association (2013). *National Coalition for Core Arts Standards*.
- NGSS Lead States (2013). *Next Generation Science Standards: For States, by States*. Washington DC: The National Academies Press.
- Norris, A. (2014). Make-Her-Spaces as Hybrid Places: Designing and Resisting Self-Constructions in Urban Classrooms. *Equity & Excellence in Education*, 47, 63-77. <https://doi.org/10.1080/10665684.2014.866879>
- Peppler, K. A. (2013). STEAM-Powered Computing Education: Using E-Textiles to Integrate the Arts and STEM. *IEEE Computer*, 46, 38-43. <https://doi.org/10.1109/MC.2013.257>
- Ramadas, J. (2009). Visual and Spatial Modes in Science Learning. *International Journal of Science Education*, 31, 301-318.
- Rhodes, M. (1961). An Analysis of Creativity. *The Phi Delta Kappan*, 42, 305-310.
- Root-Bernstein, R. S. (2003). The Art of Innovation: Polymaths and the Universality of the Creative Process. In L. V. Shavinina (Ed.), *International Handbook of Innovation* (pp. 267-278). Amsterdam: Elsevier.
- Sawyer, R. K. (2012). *Explaining Creativity: The Science of Human Innovation*, (2nd ed.). Oxford: Oxford University Press.
- Schmidt, A. L. (2011). Creativity in Science: Tensions between Perception and Practice. *Creative Education*, 2, 435-455.
- Schwab, J. J., & Brandwein, P. F. (1962). *The Teaching of Science* (pp. 3-103). Cambridge, MA: Harvard University Press. <https://doi.org/10.4236/ce.2011.25063>
- Simonton, D. K. (1994). *Greatness: Who Makes History and Why*. New York, NY: Guilford Press.
- Vossoughi, S., & Bevan, B. (2014). *Making and Tinkering: A Review of the Literature*. National Research Council Committee on out of School Time STEM, 1-55.
- Walker, C. M., Winner, E., Hetland, L., Simmons, S., & Goldsmith, L. (2011). Visual Thinking: Art Students Have an Advantage in Geometric Reasoning. *Creative Education*, 2, 22-26. <https://doi.org/10.4236/ce.2011.21004>

The Application of Graded Teaching Pattern in College English Classroom Teaching

Jiqun Ding

School of Culture and Arts, Zhejiang Technical Institute of Economics, Hangzhou, China

Email: tingjq69@163.com

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Abstract

The graded teaching pattern, which takes different and targeted teaching methods according to students' English foundation and their distincted enthusiasm in English learning, is becoming one of the most common methods of teaching in College English teaching. This paper analyzes briefly the practices and explorations of graded teaching pattern in college English teaching in China in recent years, clears up relevant theoretical basis, and discusses the problems and deficiencies of this patter in application.

Keywords

Graded Teaching Pattern, College English, Classroom Teaching

1. Introduction

Because of the university enrollment expansion, there have been great changes in the number of students compared to decade years ago. As to many colleges and universities, especially the not key colleges and universities, there is obvious gap between the new enrolled students' academic levels. Even for the students of the same class, it is hard to achieve unity in learning progress.

Nowadays, Ministry of Education in China encourages quality-oriented education. The traditional teaching method which considers all the students the same is unable to meet the needs of the current education requirement. Students with relatively good English basis will feel easy and lose enthusiasm as a result while students with poor English foundation will feel too difficult and lose confidence of learning. To deal with this situation, graded teaching pattern comes into being (Dai, 2015). The graded teaching pattern originated from America. But now many universities and colleges are trying to adopt this teaching me-

thod.

2. The Theory Basis of Graded Teaching Pattern in College English Teaching

The concept of graded teaching pattern in college English teaching is to adopt different teaching methods according to different knowledge and different abilities of students, based on the class teaching system and targeted at the teaching goals and teaching requirements of college English. The different abilities of students is about the difference in the cognitive level and personality. When teachers adopts this teaching method, they will need to consider the students' adaptive abilities in learning and their different basises, and then choose the suitable teaching methods. The main purpose is to improve the quality of college English teaching, and the essence is teaching strategy.

The ancient Chinese educationalist Confucius put forward “teach students in accordance with their aptitude”. The essence of this theory is the graded teaching progress in graded teaching pattern. The truth of this teaching idea is to admit the existence of difference, and then teach distinguishingly. The American educationist Bloom once proposed the theory of mastery learning, in which he advocated that teachers just need to provide appropriate assistance when students are learning fixed materials. In this case, most of the students can complete the study task and achieve good learning effects. He believes that teachers should make different learning goals for different students, and then determine their teaching strategies combined with the goals. Teaching goals should be determined on the basis of students' learning level, learning ways and their characters. When carrying out teaching tasks, teachers should consciously make corresponding teaching strategies and provide for students a comprehensive learning experience which includes mass instruction, group study and individual study. Besides, daily teaching effect should be assessed as standard of teachers' evaluation. The former Soviet union educator Vogotsky presents the “zone of proximal development (ZPD)” which also advocates that students have two different levels of development—one is the current level and the other is potential level. The section between the two levels is called the “zone of proximal development (ZPD)”. When teachers carry out the teaching tasks, they should create better “zone of proximal development (ZPD)” continually, starting from the differences of the levels. Only in this way can the students' potential be developed, and can the students get more progress (Li, 2015).

American scholar Krashen also maintained that students should accept “understandable language input”, which means the second language input a little more difficult than the current language lever, as much as they can when they are learning a language. Students can learn the new language truly when they put attention to the knowledge with unknown information but in familiar form. So we can see that graded teaching pattern has more solid theoretical basis already,

and the basis can instruct the the graded teaching pattern to be applied into the actual teaching activities.

3. The Application of the Graded Teaching Pattern in the College English Classroom Teaching

3.1. Graded Texts

As a language discipline, English is more practical. Its teaching contents include five aspects as listening, speaking, reading, writing and translating. It is unreasonable for teachers to ask students to use identical texts when they are teaching the students English as a foreign language. So the graded texts is the basis of the graded teaching pattern. It is also the first step of “teach students in accordance of their aptitude”. When grading the texts, teachers should choose the right texts according to students’ English basis. For example, for students of agriculture, forestry, art, sports and primary school education related majors, teachers should choose texts which focus on the basic English knowledge, help them build solid English basis and master the basic English skills. When in teaching, teachers should cultivate the basic skills in English listening, speaking and writing intentionally, help students to practice their knowledge and acquire the language communicative ability (Wang, 2012). In other words, teachers should not only consider the teaching objectives, but also the students’ learning levels, the teachers’ characteristics and suitable learning methods for students when choosing the texts. When texts, teachers and students interact well, the texts can be the suitable and scientific texts. Only this kind of texts can help students get more progress.

3.2. The Graded Students and Principles

The graded students include two kinds, one is dominant hierarchical teaching and the other is recessive hierarchical teaching. The dominant hierarchical teaching is also called as “Stratification Teaching Among the Classes”, which graded the students into different levels according to fixed rules. Students of the same levels can form a new group and study with each other as a unity. While the recessive hierarchical teaching is also called “stratified teaching in the classroom” which mainly targets at the students that are already graded. It will not use the same way to grade the students as the dominant hierarchical teaching does. The teachers will carry out the targeted teaching when they already mastered the students’ situations within the class. This new method of grading the teaching objects can reduce the probability of students’ negative emotions, and avoid that they are stick with the label of “negative”. Teachers can combine two ways of grading when they carry out the teaching activities. First, teachers can grade the students into two levels according to their majors, such as students of agriculture, forestry, art, sports and primary school education related majors can be divided as one group and then grade students of this level. In this part, teachers can group the students according to their English scores in college entrance examination or placement test after entering college. Students with higher scores

can be classified as group A while students with lower scores are classified as group B. Students of group A have better English basis and stronger learning enthusiasm, so teachers should instruct students of this group in time and motivate their enthusiasm. However, students of group B is the majority of the students and they have limited English basis and weaker self-study ability. Thus for students of group B, teachers should put lecturing and practices on the equal positions. To the students with very weak English basis and poor English grammar and vocabulary knowledge, teachers should try to arouse their enthusiasm of learning English. At the same time, because of their limited self-study ability, teachers should combine lecturing in the class with tutoring after class in time, and provide more help to them (Yang, 2012).

3.3. The Graded Teaching Goals

According to the relevant requirements of the ministry of education, the newly enrolled college students who failed to meet the demand of high school English curriculum standard can make the general requirement as their college study goals. The relatively higher learning standards is for students with better learning basis and self-study abilities who already achieved better English levels in high schools. College authorities should insist on the principles of sorted guidance and “teach students in accordance of their aptitude” when arrange the teaching tasks in order to meet students’ different needs of learning, and can make necessary adjustments to English teaching goals according to students’ actual situations. For example, after completing four semesters of study, students of group A should attain the “higher requirements” as described in the college students’ English requirements by the ministry of education, while group B students should attain the “general requirements”.

3.4. Carry out the Flexible Curriculum

Graded teaching needs corresponding curriculum, and the class hour needs to have some certain elasticity. This kind of curriculum can give adequate learning space to students. Students with a firm academic foundation and better study ability can acquire more knowledge in the limited time, while students with poor learning foundation and ability can make use of the class time to remedy their lack of knowledge. Only in this way can achieve the graded teaching in the real sense. College authorities should grade the students and adjust the teaching content in time according to the teaching goals. Students of group A need more study time in the early stage, and the teaching contents should include reading-writing course, audio-oral course and foreign teacher practice course. They will achieve the “general requirements” of the relevant curriculum after finishing two-semester courses’ study. Students of group B will need more sufficient time to learn knowledge, they will spent half of the class time on reading and writing learning, and the other half time on listening and speaking learning. After finishing this part of learning, students of group B can achieve the “general requirements” of the relevant curriculum.

3.5. Dynamic Teaching Management Mode

Teachers can take the “rolling method” to manage students of different grades when they are carrying out graded teaching pattern in the teaching process. At the end of each semester, classes of different grades should adjust the inner structure within the class according to students’ daily learning score, state and will. Basically, students can continue to the next study step as soon as their scores can reach the qualified level. While students whose scores fail to reach the qualified level will decreased to a lower level class to reinforce their study. Besides, college authorities can try the “exemption of College English management” when they are planning the college English study. All of the students can attend the national college English test level 4 after finishing the first two semesters’ learning. For the students who can pass the test, college can accept their applications of exemption of College English. In this way, students can make full use of their limited time and reduce the waste of study time.

One thing to note is that the basis of graded teaching pattern is to secure students of different basises can all achieve progress on academic performance and solid English foundation during college sutdies. The above mentioned “rolling method” and “exemption of College English management” can make it possible that students of different grades can exchange and circulate with each other. The goal of the management methods is to arouse students’ study will to a higher level and prompt them to achieve a better study effect by their own efforts. But in the actual teaching process, we found that some students prefer to be in a lower level class. Because it is easier to get good scores in a lower level class. The reasons for this phenomenon is that the test paper of classes of group A students is more difficult than that of classes of group B students. And English performance has direct effect on students’ awards recommendation. So related management departments in colleges should give some policy preference to students of group A in order to secure that all of the students can take part in the competition in a relatively fair form. It can not only arouse the Study enthusiasm of students of group A, but also can promote other students to study hard in aim of getting into group A.

4. Reflection on the Application of the Graded Teaching Pattern in College English Teaching

In recent years, the practical experience of various colleges has proven that the graded teaching pattern is in line with the requirements of higher education. It can let students feel relaxed when studying English, and will make the class easier too. The enthusiasm of students of different basis can be aroused. So it is very beneficial for teachers to organize class teaching. Besides, graded teaching pattern can make full use of the colleges’ multimedia devices, improve the richness and vitality of classroom teaching, which can also help to lay foundation for arousing students’ enthusiasm (Zhang, 2015).

However, the application of the graded teaching pattern still encounter some difficulties in our country. Since the enrollment expansion of domestic colleges

and universities, the number of college English teachers can not meet the needs of English teaching in many colleges and universities. In addition, as the recruiting English teachers reduces, and the mobility of teachers greatly increases, many teachers lack the correct understanding of graded teaching pattern, which can also affect the actual teaching activities. At the same time, the research capacity of teachers is also limited. While graded teaching pattern requires teachers to analyze students of different grades and choose suitable teaching ways and contents to students of different grades. In other words, the teachers group also needs to do further study, try to reach in-depth understanding of students' needs, and help them to solve problems caused during their study process. Teachers should also study with each other and find out the teaching strategies and methods by communicating with each other.

The English teaching in domestic colleges and universities faces too many students in the class which leads to the problem of management difficulty. In addition, due to the limited teaching materials, students in many colleges and universities have English class at the same time. In fact, students can not be evenly distributed due to their different basis and majors. So colleges and universities will have to consider the size of class when allocating classes. However, colleges and universities can not arrange classes based on students' real situations at the time of enrollment. So it is difficult to accurately distinguish between different grades. Besides, students of group A are always arranged to study at evening class or on weekends due to the limited study time and teaching material, which will cause discontent among them. So teachers will need to communicate with college or university authorities and find out a reasonable way. On the other hand, students of group B will have inferiority feeling. Since their basis is already poor, and the grade difference will let them lose interest in learning English. Teachers will meet with difficulties when they organize these students to study, because these students' intention to cooperate is low. So how to arouse these students' study interests and improve their study effects becomes a difficult task for teachers.

5. Conclusion

The application of graded teaching pattern in college English teaching involves many segments in the teaching process and it is not an easy task. The significance of its application in the actual teaching activities is that it can improve students' study effect, boost their enthusiasm for English learning, and enhance the quality of teaching. In this process, teachers should fully understand the students' study backgrounds and basis, explore their interests and choose the suitable teaching ways. Only this way can promote the development of college English teaching toward positive direction, achieve a better teaching result and finally improve the overall quality of the higher talents.

References

Dai, J. (2015) The Construction of College English Blended Learning Model under the

- Graded Teaching Pattern. *Journal of Chongqing Institute of Technology (Social Science edition)*, 11, 8.
- Li, Y. Y. (2015) Study on College English Teaching Reform in Common Colleges and Universities. *Journal of Hubei Institute of Technology*, 9, 138.
- Wang, Y. J. (2012) The Feasibility Analysis on Strategies of Class Management in Large-Class Lectures of College English Teaching. *Journal of Shandong Province Agricultural Management Cadre Institute*, 3, 128.
- Yang, Y. H. (2012) The Differences of Classroom Inquiry of Different Levels in College English Graded Teaching Pattern. *Foreign Language Teaching Theory and Practice*, 3, 236.
- Zhang, C. P. (2015) Empirical Research on Higher Vocational English Teaching under the Background of Multilevel Students—Take Suzhou Agricultural Vocational and Technical College as an Example. *Wuxi Vocational and Technical College Journal*, 6, 56.



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Causal Model of Variables Affecting the Creativity of Undergraduate Students

Banjob Boonchan^{1,2}, Phadungchai Pupat³, Boonchan Seesan³

¹Curriculum Research and Development, Faculty of Industrial Education, King Mongkut's Institute of Technology, Ladkrabang, Thailand

²Department of Educational Administration, Nakhon Ratchasima Rajabhat University, Nakhon Ratchasima, Thailand

³Faculty of Industrial Education, King Mongkut's Institute of Technology, Ladkrabang, Thailand

Email: banjobbun@yahoo.com

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Abstract

This research aims to select variables affecting the creativity of undergraduate students and to develop a causal model from the results. A total of 760 students participated in this study. The instruments used were the Torrance Tests of visual and written language and a questionnaire about the variables that influence creativity. Also a confirmatory factor analysis (CFA), mean and standard deviations, and a path analysis with the LISREL version 8.8 and SPSS program were used. The results show that administration, teaching, instructional climate, motivation, and personality are the variables that affect the creativity of the undergraduate students. The results from the CFA show an acceptable goodness-of-fit. The means of creativity and variables affecting creativity of the undergraduate students were at a medium and high level (between 2.98 to 3.05 and between 3.94 to 4.13), respectively. The goodness-of-fit of the causal model of the variables affecting the creativity of the undergraduate students was developed on the basis of the empirical data as well. The statistical results obtained were $\chi^2 = 125.28$, $df = 104$, $p\text{-value} = 0.07622$, $GFI = 0.98$, $AGFI = 0.97$ and $RMSEA = 0.016$, all of which are based on specified criteria.

Keywords

Causal Model, Creativity, Confirmatory Factor Analysis, Goodness of Fit

1. Introduction

In the 21st century, students should develop three core skills including learning skills, life skills, and information and technology skills. These skills are known as the 21st century skills. Learning skills consist of critical thinking, communication, teamwork, and create innovation, while life skills include ones' life goals

acknowledgement, motivation, a good planner, a right decision maker, responsibility for the results of decision making, work achievement expectation, a self-evaluation realization, and flexibility. Nonetheless, the information and technology skills including the perceiving of up to date information, and being smart to the usage of new information technology is also very important (Trilling & Fadel, 2009).

Regarding the drastic changes in social, economics, politic, and the rapid growth of technology and communication as well as the life in the digital age occur all the time, students should have skills which are necessary to survive in the 21st century. Those skills relate to the creativity and the innovation skills. Students should have a capability to express their creativity, construct knowledge and develop the innovation using technology both in the process and product. Students should also apply their existed knowledge to generate new ideas, new products or a new process in order to create a prototype which symbolizes self or group identity. In addition, students should use the model and simulations to investigate the system and the complex problems in order to find out the trends and forecast the possibilities.

Such changes caused the flow of information, the domination of science and technology as well as the conflict of a variety of prosperity. These changes call for the creation of a new learning method and concepts both in the institutions and entrepreneurships. The potentiality of concepts with the five mentality aspects is an ultimate power of the next era. Those mentality aspects include the dexterity, synthesis, creativity, respect, and ethic (Gardner, 2007). Education must be able to prepare people to live in the future world effectively. Creative thinking is seeking for new ideas and answers relevant to the interests. Gardner also identifies that creative thinking is one of the minds that need to be cultivated for the future.

According to Torrance (1979) and Torrance & Ball (1984), if any country is capable to seek out, develop, and extract out the potentiality of creativity of its nation to maximize the usefulness as much as it could, the nation would have more opportunity to be developed for prosperity. The potentiality of an educational system to promote innovation and creativity will be the indicators to measure the successfulness of the economics in the 21st century. An educational system must enable the learners to gather ideas in order to develop the original ideas or being a foundation idea of creativity (Patarawad, 2015).

The curriculum aims at promoting the students' creativity and having thinking skills. Thus, it is necessary to design the learning and teaching activities which enable the students to have more opportunity to think creatively and harmonize with the dynamic global context (Panich, 2013).

The development of thought is one of the approaches that will improve the quality of the learners. Practicing thinking skills and thinking processes are of significant factors to develop the learners' intelligence (Sindhvananda, 2013). The educators are increasingly given an importance to thinking due to the fact that they believe thinking can be developed and trained through the external en-

vironment. The educational process of each country has determined the development and promotion of thinking in their National Education Act's purposes. Creativity can be promoted and developed both directly and indirectly, but it cannot be forced to occur (Roger, 1998). Everyone has their creativity intrinsically which can be developed both in children and adults. Creativity is a brain's competency to think broadly with multi-direction as follows: 1) originality, 2) frequency, 3) flexibility, and 4) elaboration (Guildford, 1991). There are several factors which might be the main reason for the development of learners' creativity such as the administration of the executive managements, the instructors' instructions, the institutions' climate, the instructors' motivations, the learners' personality, and etc. (Boonchan, Papat, & Seesan, 2015).

Nakhon Ratchasima Rajabhat University has six faculties (colleges) comprising the Faculty of Education, Faculty of Humanities and Social Sciences, Faculty of Industrial Technology, and the Faculty of Health Sciences. The campus population totals 20,615 students aged between 18 - 25 years. The Faculty of Education students are required to study 5 years unlike the other colleges' standard 4-year programs.

Because of the above mentioned rational, the researcher under the control of Nakhon Ratchasima Rajabhat University realizes the importance of creativity, and students' creativity promotion. Thus, the researcher has studied the causal model of the variables that influence the creativity of undergraduate students at Nakhon Ratchasima Rajabhat University. The model being suggested used four measurable aspects of creativity: originality, fluency, flexibility, and elaboration. In addition, administration, teaching, motivation, personality, and instructional climate variables contribute to undergraduate students' creativity. On the other hand, the results obtained in this study intend to draw up a plan which will develop the creativity of the undergraduate students by considering the variables affected and which may also be used as information to create innovation or model that encourage creativity.

2. Literature Review

2.1. Factors Affecting the Creativity

2.1.1. Administration

Administration is backbone of an organization. Thus an effective administration would run organization professionally and smoothly. Administration has always been at the heart of organization. The main responsibility of an administrator is to ensure the efficient performance in an organization. They act as a connecting link between the senior management and the employees. They provide motivation to the work force and make them realize the goals of the organization (Mishra, Dhar, & Dhar, 1999). The first priority of leadership is to engage the right people, at the right times, to the right degree in creative work. That engagement starts when the leader recasts the role of employees. Rather than simply roll up their sleeves and execute top-down strategy, employees must contribute imagination (Amabile & Khaire, 2008). According to

Dimock (1986), creativity is perhaps the most important concept in public administration. Creativity is one of the hallmarks of leadership and is a central component in the science and, most particularly, the art of public administration. Managers can influence creativity in workers by instilling strong values, beliefs and assumptions that encourage creativity. Administration is another variable influencing the creativity of undergraduate students. This is probably due to the teachers believing that the administration encourages, supports and facilitates the directing of all activities of the university by the university executive committee. The focus group participants agreed that the composition of the three components is policy, mission, and identity with the administration contributing to the creative development of students.

2.1.2. Personality

Creative individuals are remarkable for their ability to adapt to almost any situation and to do with whatever is at hand to reach their goals (Csikszentmihalyi, 2011). Creative people tend to be both extroverted and introverted. In fact, in psychological research, extroversion and introversion are considered the most stable personality traits that differentiate people from each other and that can be reliably measured. Creative individuals, on the other hand, seem to exhibit both traits simultaneously (Nelson, Wood, & Gabris, 2011). According to Stacey (1996), bureaucratic organizations with high levels of centralization are difficult to move in a creative direction because they have restricted information flow and few connections between individuals. The dominant system in a bureaucracy consists of routines, habits, and highly defined procedures. Rich information flow, many interconnections, and diversity of behaviours and perspectives provide the raw materials for new ideas. According to the research studies and examination of the literature, it was determined that there were three key manifest variables related to creativity, which is how students perceived themselves, both physically and mentally. Many scholars have studied these manifest variables effects on personality from which the researchers have synthesized the research to include freedom, self-trust and self-esteem in this study.

2.1.3. Motivation

There is now a large body of research evidence demonstrating some surprising findings about creativity. When people are focused on extrinsic motivations—i.e. rewards and punishments—their creativity suffers. But when they are driven by intrinsic motivations—e.g. interest, meaning, purpose, learning, freedom—their creative performance soars (Basadur, 1992). As pointed out by Smith (1998), intrinsic motivation is difficult to identify because it is an internal, non-conscious process. According to the research studies and examination of the literature, it was determined that there were three key variables related to creativity. Motivation is demand, dynamic pressure or the desire to struggle in order to achieve its objectives, which may be caused naturally or by learning it, which has the researchers have synthesized the research to include needs, drive and satisfaction in this study.

2.1.4. Teaching

Children can be taught creativity and that it can be done in a variety of ways. Coaching/mentoring can help encourage and develop creative thinking and problem-solving through reflection and discussion with an external person (Deans, Oakley, James, & Wrigley, 2006). Jeffrey and Craft (2004) discussed the distinction between teaching creatively and teaching for creativity in its characterization of creative teaching. The former is defined as using imaginative approaches to make learning more interesting and effective. The latter is defined as forms of teaching that are intended to develop young people's own creative thinking or behaviour. Teaching and faculty instructional activities influence creativity of undergraduate students. According to the research studies and examination of the literature, it was determined that there were four key manifest variants or observable variables related to creativity. Many scholars have studied these manifest variants or observable variables effects on teaching from which the researchers have synthesized the research to include objectives, activity, content, and evaluation in this study.

2.1.5. Instructional Climate

A climate can be seen as various aspects of the psychological atmosphere. The climate often conveys expectations about which behaviors and attitudes that are acceptable (Amabile, 1998). Many components of a creative climate have been proposed during the years. Some examples are the degree of individual freedom, psychological safety, support and positive relationships among team members, vision provided by supervisors, creative encouragement, mission clarity, available resources, and even joy (Denti, 2011). However, Thammanit and Bussracumpakorn (2007) studied creativity of Thai adolescents between 15 - 18 years of age and stated in their key findings that "Thai adolescents cannot interpret information, generate ideas and develop creative ability in an effective way". This is consistent with Baczek (2013) that indicated that "Krengjai", one of the Thai values that encourage conflict avoidance, was indicated as one of the biggest barriers to creativity. According to the research studies and examination of the literature, it was determined that there were three key manifest variables related to creativity. Many scholars have studied these manifest variables effects on instructional climate which is the student's perception concerning the learning environment, from which the researchers have synthesized the research to include support, acceptance, and participation in this study.

2.2. Creativity

Creativity is a difficult idea to define with one being able to find a number of definitions that describe it. Gibson (2005) considered creativity as individuality. Creativity however involves mostly two particular areas which are skills and personal characteristics. Creativity is often seen as a characteristic that a person possesses, a product or outcome that is regarded as original, and a process by which an unusual, novel or suitable outcome or solution is obtained. Amabile (1998) indicated that complex and challenging jobs that enable workers to de-

cide how to carry out tasks are more likely to encourage intrinsic motivation that, in turn, increases creativity. Amabile's model of organizational creativity is one of the most widely cited in psychological studies of organizations (Heerwagen, 2002). Although not explicitly stated, the assumption behind the model is that creativity and innovation are important for all organizations and jobs. Rawlinson (2006) has stated that there are over 200 techniques used for the fostering of the creative potentials of a person. Some of these techniques are attribute listing, mind-mapping, check lists, forced relationships, 5 W's and H, lateral thinking and PO, and metaphorical thinking. The focus of this study was therefore to measure the creativity traits of the subjects in term of fluency, elaboration, flexibility and originality. According to the research studies and examination of the literature, it was determined that there were four key manifest variables related to creativity. Many scholars have studied these manifest variables effects on creativity from which the researchers have synthesized the research to include originality, fluency, flexibility and elaboration tasks in this study (Table 1).

3. Methodology

The study uses qualitative research in the first phase for investigating the variables affecting creativity from the expert discussions and quantitative research in the second phase for developing a causal model of the variables affecting the creativity.

Table 1. The latent and observed variables affecting the creativity of undergraduate students and theorists.

Latent variables	Observed variables	Theorists/Researchers
Administration (Admin)	Policy (Pol) Mission (Mis) Identity (Ide)	Dimock (1986), Amabile & Khaire (2008), Mishra, Dhar, & Dhar (1999)
Teaching (Teach)	Objective (Obj) Content (Con) Activity (Act) Evaluation (Eva)	Jeffrey & Craft (2004), Deans, Oakley, James, & Wrigley (2006)
Instructional climate (Clima)	Support (Sup) Accept (Acc) Participation (Par)	Amabile (1998), Thammanit & Bussracumpakorn (2007), Denti (2011), However & Baczek (2013)
Motivation (Motiv)	Need (Nee) Drive (Dri) Satisfaction (Sat)	Basadur (1992), Smith (1998)
Personality (Perso)	Freedom (Fre) Self-trust (Str) Self-esteem (Ses)	Stacey (1996), Csikszentmihalyi (2011), Nelson, Wood, & Gabris (2011)
Creativity (Creat)	Originality (Ori) Fluency (Flu) Flexibility (Fle) Elaboration (Ela)	Amabile (1998), Heerwagen (2002), Gibson (2005), Rawlinson (2006)

3.1. Participants

3.1.1. Phase 1

In the first phase, nine experts from both inside and outside Nakhon Ratchasima Rajabhat University took part in a group discussion. All the experts were doctoral holders who were experts in their respective fields including: curriculum and instruction, curriculum research and development, educational measurement and evaluation, educational administration, or experienced in using creativity measurements. Additionally, all had been teaching for at least one year at tertiary level.

3.1.2. Phase 2

In the second phase, respondents included 760 undergraduate students, academic year 2015, selected by stratified random sampling by their faculty. The sample size of this study was determined by using a minimum set of samples. According to a preliminary agreement in analyzing structural equation modeling using LISREL (Lindeman, Merendaand, & Gold, 1980), the ratio between a number of samples and a number of parameters, estimated or observed variables, is 20:1. To attribute a high correlation analysis as well as high statistics showing a pattern of relationships between variables, the researchers took into consideration the sample size adopting a ratio of 20 survey samples for a single variable used in the research (Tanaka & Huba, 1987). As there were 38 variables for the study and if one uses a 20:1 ratio, 760 respondents constitute a highly accurate survey population.

3.2. Instrumentation

The instruments were a Torrance Tests of Creative Thinking (TTCT) with a reliability of 0.914 and a questionnaire on the variables affecting creativity, such as administration, teaching, instructional climate, motivation and personality, and the results obtained showed a reliability of 0.925, 0.949, 0.941, 0.899, and 0.925, respectively. The Torrance Tests of Creativity Thinking (TTCT) is designed to identify and evaluate creative potential using two parts—a Verbal test and a Figural test. The tests are game-like to catch student's interests. The scoring of the tests is by hand and require careful attention to the manual for reliable results. However, streamlined guides are available and are helpful in developing greater familiarity with the test and its scoring procedures. The questionnaires which included 66 items, were collected from 760 respondents through a self-designed five-point Likert scale (ranging from Strongly Agree-5 to Strongly Disagree-1).

3.3. Data Collection

The researcher went into classes and measured the variables affecting the creativity with a questionnaire set and TTCT. Through a questionnaire with a five-point Likert scale, administration, teaching, instructional climate, motivation, and personality were measured. A TTCT provided a measure of students' general creative competence on originality, fluency, flexibility, and elaboration.

Among the 760 respondents, there were 190 male (25%) and 570 female (75%). The respondents' age ranged from 18 to 23 years and the average age was 21 years. They were tested creativity then, answering the questionnaire on variables affecting creativity.

3.4. Data Analysis

As a primary data analysis method, Structural Equation Modeling (SEM) was used to find the relationship among latent constructs described in theoretical framework for creativity of undergraduate students. The SEM techniques is a confirmatory technique based on previous theory in contrast to exploratory factory analysis. All data were screened by the Statistical Package for the Social Sciences (SPSS) 16.00 version. The program LISREL 8.80 software version was used to estimate the framework (model) for research hypotheses.

4. Results and Discussion

The variables affecting the creativity of the undergraduate students consisted of administration, teaching, instructional climate, motivation, and personality. Administration is another variable influencing the creativity of undergraduate students obtained from group discussion. This is probably due to students thinking that the administration encourages, supports, facilitates, and directs all the activities of the university, under the direction of the university executive committee. A focus group of the participants agreed on composition of the three components of administration-policy, mission, and identity. Thus, the administration also contributes to the creative development of its students. Teaching in the form of instructional activities influences the creativity of undergraduate students (Craft, 2010). Motivation is demand, dynamic pressure or the desire to struggle in order to achieve its objectives, which has three main components, including needs, drive, and satisfaction, all of which influence the creativity of undergraduate students (Yokubon, 2012). Personality is perceived as whole, which has three main components, namely a sense of individual freedom, self-trust, and self-esteem influence the creativity of undergraduate students (Tawornwet, 2010). The instructional climate is the experience of learning on the campus, which has three main components, namely the support of faculty, acceptance of faculty, and the participation of students, all of which factors influence the creativity of undergraduate students (Kreasuwan, 2010).

Means and standard deviation of creativity and variables affecting the creativity of undergraduate students shown in Table 2.

Table 2 presents the statistical means for each of the components of the creativity of undergraduate students which were at a moderate level. Nakhon Ratthasima Rajabhat University is the institute for the local development of teacher training in the Northeast. The policy of creating educational opportunities and the mission of the university is to produce graduates and promote lifelong learning to ensure educated people and create a society of knowledge. As a result this policy creates educational opportunities for local residents, and produces the

manpower to help meet both the local and the national demand.

Table 2 also presents the statistical means of the variables affecting the creativity of undergraduate students and shows that they were at a high level and personality was the highest mean. This is probably due to these variables being the components of creative development of students as [Kawkgwan \(2011\)](#) says these variables cannot be separated but they have a relationship which affects one other.

The results of the investigation into the goodness-of-fit of the causal model of the variables affecting the creativity of undergraduate students using structure equation modeling (SEM) are shown in **Table 3**.

Table 3 shows that the causal model of the variables affecting the creativity of undergraduate students which the researcher developed to fit the empirical data based on all the criteria ([Schumacker & Lomax, 2010](#); [Hair et al., 2010](#)).

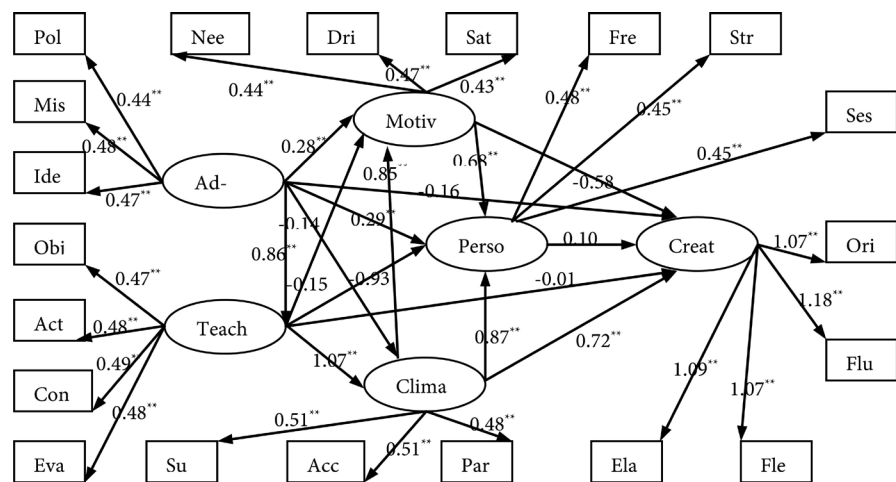
Investigation of the goodness-of-fit of the causal model of the variables affecting the creativity of undergraduate students which was developed with the empirical data show a correlation with the empirical data as well (**Figure 1**). If

Table 2. Descriptive statistics for measurements of creativity and variables affecting the creativity.

Variables	Mean	Standard deviation	Descriptive rating
1. Creativity			
1.1 Originality	2.97	1.37	Moderate
1.2 Fluency	2.99	1.37	Moderate
1.3 Flexibility	3.03	1.42	Moderate
1.4 Elaboration	3.05	1.41	Moderate
Average	3.01	1.19	Moderate
2. Variables affecting the creativity			
2.1 Administration	3.94	0.50	High
2.2 Teaching	4.05	0.50	High
2.3 Instructional climate	4.12	0.55	High
2.4 Motivation	4.08	0.50	High
2.5 Personality	4.14	0.52	High
Average	4.07	0.45	High

Table 3. The goodness-of-fit index and the predictive correlation of causal model of variables affecting the creativity of undergraduate students.

Goodness-of-fit index	Criteria	Statistics	Decision
χ^2	$p > 0.05$	0.076	Passed
χ^2/df	≤ 2.00	1.20462	Passed
GFI	≥ 0.90	0.98	Passed
AGFI	≥ 0.90	0.97	Passed
RMSEA	< 0.80	0.016	Passed



* $p < .05$, $\chi^2 = 125.28$, $df = 104$, $p\text{-value} = 0.07622$, $GFI = 0.98$, $AGFI = 0.97$, $RMSEA = 0.016$

Figure 1. Magnitude of direct, indirect, and the total influences of variables.

we consider that $\chi^2 = 125.28$, $df = 104$, $p\text{-value} = 0.07622$, $GFI = 0.98$, $AGFI = 0.97$ and $RMSEA = 0.016$ which is based on the specified criteria, we find that the paths are statistically significant.

The path from the administration to teaching factor has equal influence at 0.86. This is probably due to the administrators who control the teaching quality of the lecturers by letting students evaluate their lecturers' teachings at the end of each semester. Students can evaluate their lecturers' teachings qualitatively and quantitatively without identifying themselves who are. The administrators can use the performance as appraisal results to set up or determine policy or plan for lecturers' development while the lecturers use those results for self-improvement.

The path from the administration to instructional climate factor has equal influence at 0.14. This is probably due to the administrators who must facilitate or provide instructional resources appropriately to meet the students' needs and relevant to the nature of each program. For examples, the students who are programing in Computer, they must have adequate computers which are a vital instrument for their study in this program and it must meet all students' needs. Similarly, the students who are programing in Classical Thai Dance, they must also have adequate costumes, accessories, tapes, television, and songs for their rehearsals as well as a transportation vehicle in case of external performance in order to gain direct experience. Moreover, in a case of students who are programing in Evaluation and Measurement, they need to have different software for analyzing different types of data so that if the administrators could facilitate and provide the equipment or learning resources to meet the students' needs and necessary for each program, this would create good learning climates in the university. According to the university policy, it aims to develop the quality of education at all levels so that all students receive a high quality of education and obtain higher academic achievement. Besides, they can learn to study for themselves and live happily in society (Ebneroumi & Rishehri, 2011).

The path which is influenced by the various variables from administration to motivation is equal to 0.28. This is probably due to management policies which have created incentives for students. By promoting and developing faculty for teachers and educational personnel, they can achieve professional standards of performance. This provides strategic and operational guidance for the quality and a high standard of education for teachers, faculty and staff (Vedenpää & Lonka, 2014). This is probably due to the administrators set up plans or activity to promote students' motivations for learning by assigning the teachers and related staffs to invite well-known guest speakers whom the students are interested in to inspire them for learning on their professional and needs basis. This is a point to indicate the value and significance of education in applying the knowledge as a tool for the future career.

The path from the administration to personality factor has equal influence of 0.29. This is probably due to management policies to develop in students the creative personality by ongoing personality development activity and the continual promotion of virtue, ethics and citizenship in the education system by: a) creating a learning process for the students to cultivate moral values and pride in Thailand, a public minded philosophy of sufficient economy; b) integrating a variety of learning activities, for example, academic, life skills, art, music, culture, and religion; c) developing the learning process and providing practical activities to develop citizenship, cultivate discipline, strengthen unity, and adherence to the democratic regime with the King as head; and d) create a network of cooperation between families, religious, educational institutions, in cultivating and developing ethics for students at all levels and in types of education (Snape et al., 2014). The university' administrators must be a role model of having good personality, create a faithfulness and trustworthiness in administering the institution which can lead students to follow or imitate the behavior and want to develop their own personality appropriately with the context. Besides, the university' administrators must conduct students' personality development activity continuously in order that the students have good personality, being oneself, seeing one self's values, and accepting one self-knowledge and capabilities.

The path of motivation influences and personality factors is equal to 0.68. This is probably due to motivation which is a powerful mechanism to stimulate the body to act in particular direction. It is a necessary condition for the improvement of behaviour, actions or activities of individuals by means of intentional behaviour to achieve their desired goals. There is correlation between the level of creativity and the predominant motivation in the activities of an individual (Mynbayeva, Vishnevskay, & Sadvakassova, 2016). Regarding the motivation of an individual is an intrinsic power which drives an individual to behave on their desires basis. The behavior can be observed from an individual' personality thus, if an individual has whatever motivation, s/he will act out the behavior which can be obviously seen from his/her personality.

The path from the instructional climate to the motivation factor which has the influences of 0.85. This is possibly due to the climate in the classroom that allows

students to learn based on their interests and aptitudes. It can be seen that characteristics, beliefs values, philosophy, or the ideals of different teachers will influence and affect students differently. Kreasuwan (2010) studied the relationship between the incentives to work, the organization climate, and a case study of the organization of justice, and Ministry of Transport. The study found that the overall relationship of incentives to work and the organization climate, organizational climate and organization justice, and incentives to work and organization justices has a positive relationship with a statistical significance at 0.01. It is because a good learning climate can promote motivation for learning. In the other hand, if the climate in the classroom is not good, it can lead the learners to have demotivation in learning, have negative attitude towards the teachers, and finally get bored to learning.

The path from teaching to the instructional climate factor has the influences of 1.07. This is probably because of the psychological processes that enhance the learning of students who are effectively promoted by teachers who help students to express themselves through appropriate behaviour. Teaching isn't merely transmitting knowledge to students; it's also about teaching students to approach learning in engaging and approaching unexpected ways (Drapeau, 2014). Thus, they can communicate their needs and feelings effectively. This will create a positive impact on the classroom climate. A good atmosphere in class facilitates and promotes effective learning and the development of the personality of students. The teaching behavior of the lecturers will always correlate with the learning climate most. This might be resulted from the designing of teaching and learning activities which are mostly made by the teachers. The good climate of teachings is such as assigning students to participate in the activities, accepting the knowledge and capability of an individual student, treating each student equally, being friendly with them, and accepting their comments, and etc. There are many different dimensions of creativity, both in inputs and outputs, and a key challenge for policymakers and educators is to understand for which inputs increasing their levels will lead to higher levels of creativity in the economy, and on how to create an enabling environment for the effective transfer of creative inputs—such as education—into creative outputs—such as new business formation. Further research should concentrate on other variables such as socioeconomic, nurturing, emotional quotient, reasoning ability, and achievement that influencing creativity of the students. In addition, data analysis, should be analyzed by Hierarchical Linear Modeling (HLM) which is a complex form of ordinary least square (OLS) regression that is used to analyze variance in the outcome variables when the predictor variables are at varying hierarchical levels. HLM accounts for the shared variance in hierarchically structured data. The techniques accurately estimates lower-level slopes and their implementation in estimating higher-level outcomes.

5. Conclusion and Recommendation

The variables affecting creativity consisted of teaching, motivation, personality,

and atmosphere of learning and teaching. Hence, the end users of this research should be taken into consideration regarding these variables directly or indirectly influencing creativity of the students. To avoid the duplication of conducting activities as well as to high yield efficiency on budgeting, the cooperation within the faculty should be made.

According to the goodness-of-fit index of model, the alternative model was well harmonized to the empirical data. The executive committee of the university must understand about what are the motivations that can promote students' creativity. The students should be supported, assisted, and suggested to conduct activities relied on their interests. They should be admired their success regarding the creativity development.

References

- Amabile, T. (1998). How to Kill Creativity. *Harvard Business Review*, 76, 76-87.
- Amabile, T. M., & Khaire, M. (2008). Creativity and the role of the leader. *Harvard Business Review*, 86, 100-109.
- Baczek, K. (2013). *Effective Leadership in Thailand: Exploratory Factor Analysis of Creativity, Need for Achievement, Emotional Intelligence, and Diversity*. <http://tinyurl.com/zk8smto>
- Basadur, M. (1992). Managing Creativity: A Japanese Model. *Academy of Management Executive*, 6, 29-41. <https://doi.org/10.5465/ame.1992.4274394>
- Boonchan, B., Pupat, P., & Seesan, B. (2015). Variables Affecting the Creativity of Undergraduate Students at Nakhon Ratchasima Rajabhat University. *Creative Education*, 6, 2241-2249. <https://doi.org/10.4236/ce.2015.621231>
- Craft, A. (2010). Teaching for Possibility Thinking—What Is It and How Do We Do It? *Learning Matters*, 15, 19-23.
- Csikszentmihalyi, M. (2011). *The Creative Personality*. <https://www.psychologytoday.com/articles/.../the-creative-personality>
- Deans, F., Oakley, L., James, R., & Wrigley, R. (2006). *Coaching and Mentoring for Leadership Development in Civil Society*. <https://books.google.co.th/books?isbn=3954894904>
- Denti, L. (2011). *Leadership and Innovation: How and When Do Leaders Influence Innovation in R&D Teams?* Gothenburg: University of Gothenburg Press.
- Dimock, M. (1986). Creativity. *Public Administration Review*, 46, 3-7. <https://doi.org/10.2307/975436>
- Drapeau, P. (2014). *Sparkling Student Creativity: Practical Ways to Promote Innovative Thinking and Problem Solving*. North Garden, VA: ASCD.
- Ebneroumi, S., & Rishehri, A. P. (2011). Towards a Conceptual Framework for the Characteristics of a Creative School. *Social and Behavioral Sciences*, 15, 2253-2258. <https://doi.org/10.1016/j.sbspro.2011.04.089>
- Gardner, H. (2007). *Five Minds for the Future*. Cambridge, MA: Harvard Business Review.
- Gibson, H. (2005). What Creativity Isn't? The Presumptions of Instrumental and Individual Justifications for Creativity in Education. *British Journal of Educational Studies*, 53, 148-167. <https://doi.org/10.1111/j.1467-8527.2005.00288.x>
- Guildford, J. P. (1991). Some Changes in the Structure of Intellect Model. *Educational and Psychological Measurement*, 48, 1-4.

- Hair, J. F, Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Analysis*. Upper Saddle River, NJ: Pearson Education International.
- Heerwagen, J. H. (2002). *Creativity-Chapter 15*. <http://tinyurl.com/7jf56gg>
- Jeffrey, B., & Craft, A. (2004). Teaching Creatively and Teaching for Creativity: Distinctions and Relationships. *Educational Studies*, 30, 77-87.
<https://doi.org/10.1080/0305569032000159750>
- Kawkgwan, S. (2011). *Theory of Personality Psychology*. Bangkok: Community Doctor.
- Kreasuwan, U. (2010). *Relationship among Work Motivation, Organizational Climate and Organizational Justice: A Case Study Department of Rural Road (Head Quarter) Ministry of Transport*. MS Thesis, Chonburi: Burapa University.
- Lindeman, R. H., Merenda, P. F., & Gold, R. Z. (1980). *Introduction to Bivariate and Multivariate Analysis*. Glenview, IL: Scott, Foresman and Company.
- Mishra, P., Dhar, U., & Dhar, S. (1999). Job Satisfaction as a Correlate of HRD Climate: An Empirical Study. *Indian Journal of Training & Development*, 29, 5.
- Mynbayeva, A., Vishnevskay, A., & Sadvakassova, Z. (2016). Experimental Study of Developing Creativity of University Students. *Social and Behavioral Sciences*, 217, 407-413. <https://doi.org/10.1016/j.sbspro.2016.02.113>
- Nelson, K. L., Wood, C. H., & Gabris, G. T. (2011). Innovation Management in Local Government: An Empirical Analysis of Suburban Municipalities. *International Journal of Organization Theory and Behavior*, 14, 301-328.
- Panich, W. (2013). *Learning Path for Students in the 21st Century*. Bangkok: Sod-sri-Saridwong Foundation.
- Patarawad, K. (2015). *Local Education Reset for Society Equity*. Bangkok: King Prajadhipok's Institute.
- Rawlinson, J. G. (2006). *Creative Thinking and Brainstorming*. New Delhi: Jaico Publishing House.
- Roger, C. R. (1998). *Freedom to Learn for the 80s*. New York, NY: Free Press.
- Schumacker, R. E., & Lomax, R. G. (2010). *A Beginner's Guide to Structural Equation Modeling*. New York, NY: Routledge.
- Sindhvananda, S. (2013). *Develop Thinking Skill*. Bangkok: Leangsiang.
- Smith, G. F. (1998). Idea-Generation Techniques: A Formulary of Active Ingredients. *Journal of Creative Behavior*, 32, 107-133.
<https://doi.org/10.1002/j.2162-6057.1998.tb00810.x>
- Snape, D. J., Davies, D., Collier, C., Howe, A., Digby, R., & Hay, P. (2014). The Impact of Creative Learning Environments on Learners: A Systematic Literature Review. *Improving School*, 16, 21-31. <https://doi.org/10.1177/1365480213478461>
- Stacey, R. D. (1996). *Complexity and Creativity in Organizations*. San Francisco, CA: Berrett-Koehler.
- Tanaka, J. S., & Huba, G. J. (1987). A Fit Index for Covariance Structure Models under Arbitrary GLS Estimation. *British Journal of Mathematical and Statistical Psychology*, 38, 197-201. <https://doi.org/10.1111/j.2044-8317.1985.tb00834.x>
- Tawornwet, P. (2010). *Healthy p Personality*. Bangkok: Attention.
- Thammanit, V., & Bussracumpakorn, C. (2007). *Creativity Problems of the Thai Adolescents: Body-Brain-Mind Approach*.
www.arch.kmutt.ac.th/index.php/about/files/.../handbook.pdf?ln
- Torrance, E. P. (1979). *The Search for Satori & Creativity*. Buffalo, NY: Creative Education Foundation.

- Torrance, E. P., & Ball, O. E. (1984). *Torrance Tests of Creative Thinking Streamlined (Revised) Manual, Figural A and B*. Bensenville, IL: Scholastic Testing Service.
- Trilling, B., & Fadel, C. (2009). *21st Century Skills: Learning for Life in Our Times*. San Francisco, CA: Jossey-Bass.
- Vedenpää, I., & Lonka, K. (2014). Teachers' and Teacher Students' Conceptions of Learning and Creativity. *Creative Education*, 5, 1821-1833.
<https://doi.org/10.4236/ce.2014.520203>
- Yokubon, N. (2012). Factors Affecting the Achievement of Science, Grade 6 Students at Demonstration Schools under the Commission of Higher Education, Ministry of Education. *Journal of Education and Social Development*, 8, 85-102.



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Encouraging Innovation in Teen Pregnancy Prevention Programs

Kelly L. Wilson¹, Whitney R. Garney¹, Christi N. Hays¹, Jordan L. Nelon¹, Jennifer L. Farmer²,
Kenneth R. McLeroy²

¹Department of Health and Kinesiology, Texas A&M University, College Station, TX, USA

²Center for Community Health Development, School of Public Health, Texas A&M University, College Station, TX, USA

Email: kwilson@tamu.edu, wrgarney@tamu.edu, Cnhays2011@tamu.edu, jlnelon@tamu.edu, jfarmer@sph.tamhsc.edu,

KMcleroy@sph.tamhsc.edu

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Abstract

While there is widespread support for implementing evidence-based interventions to improve adolescent health, health programs either become out dated and the participants are not engaged or new programs are needed for underserved populations. Innovation receives attention in health care and health systems. However, in health education the focus on innovation surrounds translating programs into practice; there is a lack of information on developing innovative programs which address disparities in teen pregnancy prevention. Given no guidelines exist to support the development of innovative programs in health, this skill is generally lacking and not widely used nor considered especially in content areas like teen pregnancy prevention. This paper discusses the gaps and opportunities for supporting and fostering innovation in adolescent health and teen pregnancy prevention programming.

Keywords

Innovation, Design, Program Development, Teen Pregnancy Prevention, Health Education

1. Introduction

Teen pregnancy is a frequently discussed social issue. Nationally, there is widespread support for evidence-based interventions to decrease a young person's risk of experiencing or causing an unintended pregnancy. Traditionally, sexual health programs have targeted individual behavior change and have been offered primarily in school and community settings (Farb & Margolis, 2016). In order to reach the most at risk youth or underserved populations, new approaches and settings must be incorporated into the evidence-base. As a result, one important,

emerging trend among funders is addressing current disparities in teen pregnancy prevention through developing innovative programs (US Department of Health and Human Services, Assistant Secretary for Health, *Office of Adolescent Health* [OAH], 2016C).

While innovation has received increasing attention in education (Huberman & Miles, 2013), health (Leshner, Terry, Schultz, & Liverman, 2013), and social sciences (Wandersman, Chien, & Katz, 2012), much of the attention in innovation has focused on translating programs or best practices into new settings; thus, it focuses on adoption rather than intervention development. Healthcare settings frequently focus on creating new services or products that improve customer satisfaction and cost effectiveness of procedures (Free et al., 2013; Chaudoir, Dugan, & Barr, 2013), but they neglect wide-scale replication or translation. Within the field of health education in the higher education setting, innovation has been used to flip classroom instructional models (Galway, Corbett, Takaro, Tairyan & Frank, 2014), enhance instruction through game-based methods for training and education, and teach cultural competence to the emerging health workforce (Abdulmajed, Park & Tekian, 2015; Neilsen, Noone, Voss & Matthews, 2013). While working with youth and adolescents, innovation could be utilized to advance classroom or group-based instruction, enhance participants' comfort in the education environment, and improve uptake of health-related information. As the field of health education continues to expand its application, there is a lot to learn about innovation principles and how they can be used to develop new solutions for complex issues.

Current public health guidelines frequently promulgated to strengthen health and public health practice, and public health guidelines frequently outline requirements for systematic literature review (Moher et al., 2015), procedures for implementation and replication (Hoffmann, et al., 2014) and for standard expectations for efficacy, effectiveness and the ability to scale-up an intervention (Gottfredson et al., 2015). However, no guidelines exist to support the development of innovative programs. Therefore, innovative program design is generally lacking and not widely used nor considered.

The concept and process of program innovation provides an opportunity to overcome frequent disconnects between program characteristics and the intended target population's needs (Kasper & Glohesy, 2008). The 2016 Evidence-Based Programs list highlights models that are often implemented within community and school settings and use a traditional classroom-based methodology to deliver teen pregnancy prevention efforts (OAH, 2016a; OAH, 2016b; Farb & Margolis, 2016). Despite sexuality education standards (Future of Sex Education Initiative, 2012), promising programs and an evidence-based programs list, youth often lack access to sexuality-related instruction (Guttmacher Institute, 2010-2011; Lindberg, Maddow-Zimet, & Boonstra, 2016). Existing programs utilize many of the teaching practices used in community and school settings and still adhere to models emphasizing the traditional classroom based methodologies to deliver the content.

The purpose of this paper is to explore the current state of programs developed for populations at increased risk for unintended pregnancy, discuss how teen pregnancy prevention programs can be strengthened through innovations design and implementation setting, and examine how innovative programs can strengthen their effects on populations at greatest risk.

2. Evidence Based Programs and Gaps in Teen Pregnancy Prevention

In 2007, a review of programs designed to reduce adolescent sexual risk behaviors identified effective interventions which delayed sexual behaviors, increased contraceptive use, and reduced teen pregnancy (Kirby, 2007). Since that time, several sexual health programs have been identified as effective in reducing teen pregnancy, STIs, and associated sexual risk behaviors among specific target populations (OAH, 2016a; Maness & Buhi, 2013). In support of a growing field to decrease teen and unplanned pregnancy, an evidence-based program list was established and supported by government entities such as the U.S. Department of Health and Human Services' Office of Adolescent Health (OAH), Administration for Children and Families (ACF), and the Centers for Disease Control and Prevention (CDC) (OAH, 2016a; OAH, 2016b).

Most of the programs on the federal Evidence-Based Programs list, were designed for implementation in middle and high schools, clinics, after school or community-based organizations, and specialized settings. Programs were designed with a number of approaches ranging from abstinence-based to sexual health education, youth development to programs designed for delivery in a clinical setting and various programs for special populations (OAH, 2016a; OAH, 2016b; Kappeler & Farb, 2014). Further, many programs were based on population based approaches and designed to be implemented with an entire target population based on race, ethnicity, or other identifiable social characteristics, such as African Americans and Hispanic and/or Latinos (OAH, 2015).

Evidence-based teen pregnancy programs are primarily designed to affect adolescent pregnancy risks and impact change at the individual-level and focused on the participants' characteristics such as knowledge, skills, attitudes, values, and individual access to resources (Goesling, Colman, Trenholm, Terzian & Moore, 2014). As a result, they may not adequately address important contextual factors that contribute to adolescent pregnancy, such as stage of sexual career, relationships with partners, social norms within identifiable social groups, and systematic factors, such as availability and access to contraceptives (Douglas & Fenton, 2013). It is suggested program developers should strengthen individually-oriented approaches to a more ecological and systemic approach that supports programs in a variety of new settings and populations and that include interventions and targets of change at multiple intervention levels, including interpersonal, organizational, community, policy, and system level changes.

3. Innovation in Health Education Programs

Theories, frameworks, and models guide program planning and evaluation within the field of health education; however, limited guidance exists for innovative design and strategy or strategies during program development. The construct of innovation has historically focused on adoption and dissemination (Rogers, 1995; Wandersman et al., 2008; Wandersman, Imm, Chinman & Kaftarian, 2000). For example, Diffusion of Innovations provides an understanding to how, why, and at what rate an innovation is distributed among groups. This theory includes elements related to an innovation's characteristics, characteristics of potential adopters, and characteristics of the social system that influence spread and adoption of an innovation. It is recognized the process of adoption is influenced by human capital, but also occurs within complex systems (Rogers, 1995). Additional frameworks have been adapted or developed to support the implementation and dissemination of health programs. For example, Wandersman created the Interactive Systems Framework as an aid to implement and disseminate program models. This framework allows for feedback among systems working together, which theoretically enables innovators to creatively develop and operationalize their teen pregnancy prevention programs (Wandersman et al., 2008; Lewis et al., 2012). Despite frameworks and models focused on the adoption process, there is a lack of focus on the practice of utilizing innovative design thinking and approaches during the planning and development of such programs.

The design and development of health education programs using innovative strategies can enhance the potential for success. Many innovations are generated by gathering insights from the intended target population(s), multiple perspectives, which includes empathizing and brainstorming to rapidly prototype ideas that are usable by others (Brown & Wyatt, 2015, Kasper & Glohesy, 2008). Creating new programs is not just about having an exciting idea; those that successfully navigate innovative design utilize a process that results in successful planning and development. Through an organized and systematic approach, program designers should spend time understanding the needs of their population, which will lead to program innovations with greater results and ultimately benefit more people over time (Kasper & Glohesy, 2008).

4. Fostering Innovation in Teen Pregnancy Prevention

In 2010, the President's Teen Pregnancy Prevention Initiative was funded to support medically accurate and age-appropriate programs that reduce teen pregnancy and sexual risk related behaviors. This initiative is administered by the Office of Adolescent Health, with similar initiatives administered by Administration for Children and Families (ACF) and Centers for Disease Control and Prevention (CDC). In 2010-2014, OAH funded organizations to replicate and evaluate teen pregnancy prevention programs that have proven to be effective, or supported programs considered "promising" (Kappeler & Farb, 2014). The early support of promising programs was an initial investment in advancing teen

pregnancy prevention programs; however, given the ongoing gaps and disparities in existing evidence-based teen pregnancy prevention programs and approaches, two large scale projects were funded in 2015 to foster and support innovative approaches to teen pregnancy prevention (Kappeler & Farb, 2014). One project was funded to focus on technology-based innovations in teen pregnancy prevention, the other project seeks to answer, “how can we foster innovation in teen pregnancy prevention programs that are innovative in design and approach to impact populations at greatest risk?”

Innovation has been utilized in the public sector for several decades and has common characteristics that can be utilized in teen pregnancy prevention. De Vries, Bekkers, and Tummers (2015) conducted a systematic literature review and reported on the types and goals of innovation. In addition to identifying the context in which innovation was applied and defined, multiple types of innovation were identified, including: process innovation, product or service innovation, governance innovation, and conceptual innovation. Understanding the different types or dimensions of innovation is important because innovation characteristics can impact the focus as well as the adoption of the process or program. Related to the teen pregnancy prevention initiative, process innovation and product or service innovation would describe many of the initiatives identified in the literature as innovative. However, governance innovation and conceptual innovation could expand the approach and potential impact of teen pregnancy prevention initiatives.

Innovation and Teen Pregnancy Prevention Programs

Innovation design is a trend in health care and health systems and has been used to improve social impacts on health (Brown & Wyatt, 2015). Despite growing trends of utilizing innovation design to develop products for use by target populations, significant opportunities exist to understand its use in planning and implementation of health-related prevention programs, particularly in areas like teen pregnancy prevention.

While the field of teen pregnancy prevention has advanced scientific understanding of implementing and replicating evidence-based programs (Koh, 2014; Margolis & Roper, 2014), gaps in meeting target population needs, delivering programs in various settings, utilizing different levels of intervention, and offering non-traditional programs still exist. Fostering and supporting innovation is necessary to keep up with the advances in human behavior and technology, thus the question, “how can the field advance programs that are innovative and engage the target population *and* impact adolescent pregnancy or birth rates” still remains.

Although we ask the question about advancing programs through innovation, the concept of cultivating innovation in teen pregnancy prevention initiatives has been supported. Teen pregnancy prevention programs described as innovative incorporated life planning and goal setting (Barbee, Cunningham, van Zyl, Antle, & Langley, 2016), cultural relevance and sensitivity (Jenner et al., 2016;

Abe, Barker, Chan & Eucogco, 2016), technology (Kaufman, Schwinn, Black, Keane & Big Crow, 2016; Markham, et al., 2012; Bull et al., 2016, Downs et al., 2004), and holistic youth development approaches targeting adolescent risk behaviors (Piotrowski & Hedeker, 2016). Lessons learned related to the future implementation of these programs include the cost and time of program implementation, training of facilitators and staff, using hybrid approaches to tailor activities for participants, and incorporating culturally relevant stories/examples and values (Barbee, Cunningham, van Zyl, Antle, & Langley, 2016; Abe, Barker, Chan & Eucogco, 2016; Bull et al., 2016; Piotrowski & Hedeker, 2016; Downs et al., 2004). However, counter to the concept of rapidly capturing and prototyping ideas to programs (Wilson & Rosenberg, 1988), teen pregnancy prevention models have been slow in their uptake by organizations and facilitators outside government funded grantees (Rolleri, Wilson, Paluzzi & Sedivy, 2008). While these approaches address content gaps in existing programs, a review of emerging promising programs indicates a majority of these emerging teen pregnancy prevention programs will still be traditional in design and approach.

Some have called for innovative thinking and design as a tool to be used and applied to teen pregnancy prevention programs. In 2015 the Department of Health and Human Services' Office of Adolescent Health frames innovative programs "broadly as new or promising approaches, strategies, interventions, or curricula, informed by scientific theory or empirical evidence that may lead to or have the potential to result in a substantial reduction in teen pregnancy rates, sexual transmitted infection (STIs) rates, and associated sexual risk behaviors" (Office of Adolescent Health, 2015). Within the literature, Rolleri, Wilson, Paluzzi, and Sedivy (2008) use the identification of tangible tools which lead to a reduction in adolescent sexual risk-taking behavior as a form of innovation, but they do not specify needs related to program planning, implementation, or delivery methods.

5. Concluding Comments

Program designers strive to create programs which address multifaceted issues and factors influencing teen sexual health and pregnancy rates. Development of innovative programs is a challenge because it takes time to rigorously test and evaluate programs so they can be deemed effective. Guidelines and expectations are clearly outlined to identify an acceptable study of a program; however, respective guidelines to drive innovative program development is lacking. Given that few existing programs are what would be called creative and engaging to the target audience and environments in innovative ways, new programs are needed or adaptations to existing programs need to occur.

The need has emerged for programs in teen pregnancy prevention to be developed innovatively and with multiple approaches. To begin incorporating innovative design into programs, a safe space for creative ideas to emerge is needed and the intermediaries funded to enhance and support innovation in teen pregnancy prevention poised themselves to provide such environment. This

will increase the possibility that programs in the future look different from those on the evidence based list and currently in existence. While changes in effectiveness may not be noticeable right away, we can see the participants are more engaged in the program and still affect the rates of teen pregnancy.

This article contends innovation has a place in adolescent health program planning beyond its current application of program adoption and dissemination. The teen pregnancy prevention initiative offers one step towards understanding how innovative design strategies and multi-level approaches can advance the field and how our team can identify innovative initiatives in the next few years. Perhaps a new way of thinking can provide opportunities and insights for designers which will aid facilitators and participants. The challenge is establishing a creative and engaging teen pregnancy prevention program for the users which is different from what already exists, and is new and innovative for the field, then testing and disseminating for adoption before the program loses its innovative characteristics.

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References

- Abdulmajed, H., Park, Y. S., & Tekian, A. (2015). Assessment of Educational Games for Health Professions: A Systematic Review of Trends and Outcomes. *Medical Teacher*, 37, S27-S32. <https://doi.org/10.3109/0142159X.2015.1006609>
- Abe, Y. Y., Barker, L. T., Chan, V., & Eucogco, J. (2016). Culturally Responsive Adolescent Pregnancy and Sexually Transmitted Infection Prevention Program for Middle School Students in Hawaii. *American Journal of Public Health*, 106, S110-S116. <https://doi.org/10.2105/AJPH.2016.303395>
- Barbee, A. P., Cunningham, M. R., van Zyl, M. A., Antle, B. F., & Langley, C. N. (2016). Impact of Two Adolescent Pregnancy Prevention Interventions on Risky Sexual Behavior: A Three-Arm Cluster Randomized Control Trial. *American Journal of Public Health*, 106, S85-S90. <https://doi.org/10.2105/AJPH.2016.303429>
- Brown, T., & Wyatt, J. (2015). Design Thinking for Social Innovation. *Annual Review of Policy Design*, 3, 1-10.
- Bull, S. S., Devine, S., Schmiede, S. J., Pickard, L., Campbell, J., & Shlay, J. C. (2016). Text Messaging, Teen Outreach Program, and Sexual Health Behavior: A Cluster Randomized Trial. *American Journal of Public Health*, 106, S117-S124. <https://doi.org/10.2105/AJPH.2016.303363>
- Chaudoir, S. R., Dugan, A. G., & Barr, C. H. (2013). Measuring Factors Affecting Implementation of Health Innovations: A Systematic Review of Structural, Organizational, Provider, Patient, and Innovation Level Measures. *Implementation Science*, 8, 22. <https://doi.org/10.1186/1748-5908-8-22>
- Department of Health and Human Services, Office of the Assistant Secretary for Health, Office of Adolescent Health (2016c) *Supporting and Enabling Early Innovation to Ad-*

- vance Adolescent Health and Prevent Teen Pregnancy: Overview of Funded Grant Projects.
https://www.hhs.gov/ash/oah/oah-initiatives/tpp_program/assets/tier-2a-descriptions.pdf
- Douglas Jr., J. M., & Fenton, K. A. (2013). Understanding Sexual Health and Its Role in More Effective Prevention Programs. *Public Health Reports*, 128, 1-4.
<https://doi.org/10.1177/00333549131282S101>
- Downs, J. S., Murray, P. J., Bruine de Bruin, W., Penrose, J., Palmgren, C., & Fischhoff, B. (2004). Interactive Video Behavioral Intervention to Reduce Adolescent Females' STD Risk: A Randomized Controlled Trial. *Social Science & Medicine*, 59, 1561-1572.
<https://doi.org/10.1016/j.socscimed.2004.01.032>
- Farb, A. F., & Margolis, A. L. (2016). The Teen Pregnancy Prevention Program (2010-2015): Synthesis of Impact Findings. *American Journal of Public Health*, 106, S9-S15. <https://doi.org/10.2105/AJPH.2016.303367>
- Free, C., Phillips, G., Watson, L., Galli, L., Felix, L., Edwards, P., Haines, A. et al. (2013). The Effectiveness of Mobile-Health Technologies to Improve Health Care Service Delivery Processes: A Systematic Review and Meta-Analysis. *PLoS Medicine*, 10, e1001363. <https://doi.org/10.1371/journal.pmed.1001363>
- Future of Sex Education Initiative (2012). *National Sexuality Education Standards: Core Content and Skills, K-12*.
- Galway, L. P., Corbett, K. K., Takaro, T. K., Tairyan, K., & Frank, E. (2014). A Novel Integration of Online and Flipped Classroom Instructional Models in Public Health Higher Education. *BMC Medical Education*, 14, 181.
<https://doi.org/10.1186/1472-6920-14-181>
- Goesling, B., Colman, S., Trenholm, C., Terzian, M., & Moore, K. (2014). Programs to Reduce Teen Pregnancy, Sexually Transmitted Infections, and Associated Sexual Risk Behaviors: A Systematic Review. *Journal of Adolescent Health*, 54, 499-507.
<https://doi.org/10.1016/j.jadohealth.2013.12.004>
- Gottfredson, D. C., Cook, T. D., Gardner, F. E., Gorman-Smith, D., Howe, G. W., Sandler, I. N., & Zafft, K. M. (2015). Standards of Evidence for Efficacy, Effectiveness, and Scale-Up Research in Prevention Science: Next Generation. *Prevention Science*, 16, 893-926. <https://doi.org/10.1007/s11121-015-0555-x>
- Guttman Institute (2010-2011). *State Policies in Brief. Sex and STI/HIV Education*. New York: Guttman Institute.
- Hoffmann, T. C., Glasziou, P. P., Boutron, I., Milne, R., Perera, R., Moher, D., Lamb, S. E. et al. (2014). Better Reporting of Interventions: Template for Intervention Description and Replication (TIDieR) Checklist and Guide. *BMJ*, 348, g1687.
<https://doi.org/10.1136/bmj.g1687>
- Huberman, A. M., & Miles, M. B. (2013). *Innovation up Close: How School Improvement Works*. Berlin: Springer.
- Jenner, E., Jenner, L. W., Walsh, S., Demby, H., Gregory, A., & Davis, E. (2016). Impact of an Intervention Designed to Reduce Sexual Health Risk Behaviors of African American Adolescents: Results of a Randomized Controlled Trial. *American Journal of Public Health*, 106, S78-S84. <https://doi.org/10.2105/AJPH.2016.303291>
- Kappeler, E., & Farb, A. (2014). Historical Context for the Creation of the Office of Adolescent Health and the Teen Pregnancy Prevention Program. *Journal of Adolescent Health*, 54, S3-S9. <https://doi.org/10.1016/j.jadohealth.2013.11.020>
- Kasper, G., & Glohesy, S. (2008). *Intentional Innovation: How Getting More Systematic about Innovation Could Improve Philanthropy and Increase Social Impact (Rep.)*. WK

- Kellogg Foundation Website.
<https://www.wkkf.org/resource-directory/resource/2008/09/intentional-innovation-full-report>
- Kaufman, C. E., Schwinn, T. M., Black, K., Keane, E. M., & Big Crow, C. K. (2016). *The Promise of Technology to Advance Rigorous Evaluation of Adolescent Pregnancy Prevention Programs in American Indian and Alaska Native Tribal Communities*.
- Kirby, D. (2007). *Emerging Answers 2007: Research Findings on Programs to Reduce Teen Pregnancy and Sexually Transmitted Diseases*. Washington DC: National Campaign to Prevent Teen and Unplanned Pregnancy.
- Koh, H. (2014). The Teen Pregnancy Prevention Program: An Evidence-Based Public Health Program Model. *Journal of Adolescent Health, 54*, S1-S2.
<https://doi.org/10.1016/j.jadohealth.2013.12.031>
- Leshner, A. I., Terry, S. F., Schultz, A. M., & Liverman, C. T. (2013). *Committee to Review the Clinical and Translational Science Awards Program at the National Center for Advancing Translational Sciences*. Board on Health Sciences Policy, Institute of Medicine, the CTSA Program at NIH: Opportunities for Advancing Clinical and Translational Research.
- Lewis, K., Lesesne, C., Zahniser, S., Wilson, M., Desiderio, G., Wandersman, A., & Green, D. (2012). Developing a Prevention Synthesis and Translation System to Promote Science—Based Approaches to Teen Pregnancy, HIV and STI Prevention. *American Journal of Community Psychology, 50*, 553-571.
<https://doi.org/10.1007/s10464-012-9510-1>
- Lindberg, L., Maddow-Zimet, I., & Boonstra, H. (2016). Changes in Adolescents' Receipt of Sex Education, 2006-2013. *Journal of Adolescent Health, 58*, 621-627.
<https://doi.org/10.1016/j.jadohealth.2016.02.004>
- Margolis, A. L., & Roper, A. Y. (2014). Practical Experience from the Office of Adolescent Health's Large Scale Implementation of an Evidence-Based Teen Pregnancy Prevention Program. *Journal of Adolescent Health, 54*, S10-S14.
<https://doi.org/10.1016/j.jadohealth.2013.11.026>
- Markham, C. M., Tortolero, S. R., Peskin, M. F., Shegog, R., Thiel, M., Baumler, E. R., Robin, L. et al. (2012). Sexual Risk Avoidance and Sexual Risk Reduction Interventions for Middle School Youth: A Randomized Controlled Trial. *Journal of Adolescent Health, 50*, 279-288. <https://doi.org/10.1016/j.jadohealth.2011.07.010>
- Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., & Stewart, L. A. (2015). Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 Statement. *Systematic Reviews, 4*, 1-9.
<https://doi.org/10.1186/2046-4053-4-1>
- Piotrowski, Z. H., & Hedeker, D. (2016). Evaluation of the Be the Exception Sixth-Grade Program in Rural Communities to Delay the Onset of Sexual Behavior. *American Journal of Public Health, 106*, S132-S139. <https://doi.org/10.2105/AJPH.2016.303438>
- Rogers, E. M. (1995). *Diffusion of Innovations* (4th ed.). New York: Free Press.
- Rolleri, L. A., Wilson, M. M., Paluzzi, P. A., & Sedivy, V. J. (2008). Building Capacity of State Adolescent Pregnancy Prevention Coalitions to Implement Science-Based Approaches. *American Journal of Community Psychology, 41*, 225-234.
<https://doi.org/10.1007/s10464-008-9177-9>
- US Department of Health and Human Services, Office of the Assistant Secretary for Health, Office of Adolescent Health (2015). *Supporting and Enabling Early Innovation to Advance Adolescent Health and Prevent Teen Pregnancy (Tier 2A)*. DHHS Announcement No. AH-TP2-15-001, Washington DC: US Government Printing Office.
<https://www.hhs.gov/ash/oah/grants/2015%20FOAs/tier2a-foafile.pdf>

US Department of Health and Human Services, Office of the Assistant Secretary for Health, Office of Adolescent Health (2016a). *Evidence-Based Teen Pregnancy Prevention Programs at a Glance*.

https://www.hhs.gov/ash/oah/oah-initiatives/teen_pregnancy/training/Assests/ebp-table.pdf

US Department of Health and Human Services, Office of the Assistant Secretary for Health, Office of Adolescent Health (2016b). *TPP Resource Center: Evidence-Based Programs*. https://www.hhs.gov/ash/oah/oah-initiatives/teen_pregnancy/db/

Wandersman, A., Chien, V. H., & Katz, J. (2012). Toward an Evidence-Based System for Innovation Support for Implementing Innovations with Quality: Tools, Training, Technical Assistance, and Quality Assurance/Quality Improvement. *American Journal of Community Psychology*, 50, 445-459. <https://doi.org/10.1007/s10464-012-9509-7>

Wandersman, A., Duffy, J., Flaspohler, P., Noonan, R., Lubell, K., Stillman, L., Saul, J. et al. (2008). Bridging the Gap between Prevention Research and Practice: The Interactive Systems Framework for Dissemination and Implementation. *American Journal of Community Psychology*, 41, 171-181. <https://doi.org/10.1007/s10464-008-9174-z>

Wandersman, A., Imm, P., Chinman, M., & Kaftarian, S. (2000). Getting to Outcomes: A Results-Based Approach to Accountability. *Evaluation and Program Planning*, 23, 389-395. [https://doi.org/10.1016/S0149-7189\(00\)00028-8](https://doi.org/10.1016/S0149-7189(00)00028-8)

Wilson, J., & Rosenberg, D. (1988). Rapid Prototyping for User Interface Design. In M. Helander (Ed.), *Handbook of Human-Computer Interaction* (pp. 859-875). Amsterdam: North-Holland. <https://doi.org/10.1016/B978-0-444-70536-5.50044-0>



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